

PERIPHERAL TERMINAL  
VENDOR COMPETITIVE ANALYSIS

INPUT



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Planning Services for Management


## PERIPHERAL/TERMINAL VENDOR COMPETITIVE ANALYSIS

### ABSTRACT

This report analyzes the competitive structure of the field service operations of major peripheral/terminal vendors. Service components such as dispatching, parts distribution, pricing, and service business analysis are included. In addition, the report contains vendor case studies for Decision Data, Storage Technology Corporation, Control Data Corporation, ITT Courier, and Centronics. Case studies have been included to demonstrate various service techniques that have been introduced and administered successfully by peripheral and terminal vendors.

This competitive analysis report is based on interviews with over 20 peripheral and terminal vendors. The information resulting from these interviews was statistically analyzed to ensure confidentiality while, at the same time, identifying and interpreting field service industry trends.

The report contains 114 pages, including 32 exhibits.



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PERIPHERAL/TERMINAL  
VENDOR COMPETITIVE ANALYSIS

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# PERIPHERAL/TERMINAL VENDOR COMPETITIVE ANALYSIS

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# PERIPHERAL/TERMINAL VENDOR COMPETITIVE ANALYSIS

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## I INTRODUCTION





## I INTRODUCTION

- This report is produced by INPUT as part of the 1983 Field Service Program for the United States, for clients of that program.
- The progressive field service organization, having evolved from hardware maintenance to systems support, from cost center to profit center, is looking more and more for new ways to reduce costs while exploring new sources of revenue generation. In this report, INPUT provides a competitive analysis of the field service operations of the major peripheral and terminal systems vendors, resulting in recommendations on service offerings and improvements that will improve user satisfaction and additional sources of revenue.

### A. SCOPE

- In this report, INPUT analyzes components of the service organization, such as dispatching, parts distribution, pricing, and invoicing. Successful applications and possible improvements are noted. In addition, potential new revenue sources, such as extended services and new service offerings, are explored.
- Finally, case studies of peripheral and terminal vendors showing current applications of recommended service techniques are presented, in order to show how these techniques have resulted in successful administration of the maintenance service.

## B. METHODOLOGY

- This report is based on data gathered from large-scale vendors in interviews using the questionnaire shown in the Appendix. The data was analyzed statistically in order to present trends in the industry; company confidentiality was maintained.
- Much of the following information resulted from extensive secondary investigation of all available public information, including annual reports, 10K reports, press releases, and other media releases.
- Additional information was obtained from ongoing multiclient and custom vendor analyses conducted by INPUT.

## II EXECUTIVE SUMMARY





## II EXECUTIVE SUMMARY

### A. TOTAL SERVICE CONCEPT

- Today's peripheral and terminal user looks to the field service organization to provide systems support. Support includes the maintenance of systems software, systems hardware and, in some cases, the vendor's application software products.
- Other postsales support functions usually accomplished by marketing include user training, documentation, and systems consulting. The energies of the marketing staff, however, should be concentrated on market definition, competitive analysis, sales argument development, and application analysis - in a word, on market planning. In the same way, some of the postsales functions carried out by the sales organization (add-on sales, supplies sales and upgrades which do not widen the market served) could be made part of the field service organization's responsibilities.
- In contrast, the goal of the field service organization is the retention, satisfaction, and development of the installed user base. It is gradually becoming evident that responsibility for all postsales support activities need to be concentrated in the hands of that part of a company's organization that is best suited to handle it: field service. This does not necessarily mean making a sales representative out of the field service engineers, but it does mean placing account management responsibility in the engineer's hands.

- The benefits from such a move include improved client relations/communications, improved account control and management, and an all-around increase in productivity from company employees (e.g., reduced duplication of visits to customers and more sales time to concentrate on new account development). Substantial improvement in the quality of feedback on user needs should also result, eliminating excessively optimistic sales forecasts and highlighting actual user needs.
- Naturally such a shift in responsibility is unlikely to happen overnight and will be met by internal resistance. However, a phased transfer of responsibility for activities like ongoing user training consulting and user support documentation should begin now.

## **B. REVENUE GROWTH FROM USER REQUIREMENTS**

- One disturbing trend that is becoming apparent is that like all of the previous IBM price umbrellas, the field service umbrella is about to come down. At present it is not clear how fast or where this will happen, but it is clear that IBM intends to become very aggressive on all product fronts - and that this probably includes service pricing.
- If this were to happen, new field service revenue sources would become necessary in order to sustain the top-line (revenue) and bottom-line (profit) contributions that top management has become accustomed to. The addition of software maintenance (and the potential growth of revenues from this source) is a first line of new revenue. However, others must be found.
- In addition to the immediate transfer of some of the postsales support activities currently provided by marketing, user requirements can provide a strong guideline as to what additional/optional services can be targeted. Targets

may include, for some sections of the user base, a contractual half-hour response, a guaranteed response time, guaranteed system availability, or other services.

- The foregoing suggests that a new user base segmentation is needed that cuts across the standard groupings now used (e.g., customer size, industry sector) and concentrates on the type/quality of service needed. The result of this segmentation would be an expansion of the number of standard option contracts available to the user base, an increase in overall user satisfaction, and an increase in revenue.
- User resistance to hardware maintenance price increases is already manifest (and if the service price umbrella comes down, user resistance will increase), but there is no such resistance to software maintenance price increases as yet. This is due to the fact that hardware maintenance is currently a small line item in user budgets. INPUT believes that software maintenance prices could be on average doubled, with little user reaction. This would provide the revenue needed to fund a much-needed improvement in software support and provide the revenues to support the next generation of on-line software maintenance services.

### C. SINGLE-SOURCE MAINTENANCE

- Single-source maintenance is a very attractive option open to most equipment vendors, and one that provides the advantages of increased account control, increased service revenue, and some nice options in the future. It is a special variety of third-party maintenance - special in that it applies to a vendor's own customer base, rather than to someone else's.
- The single-source maintenance approach aims at eliminating all other vendors' maintenance contracts from a given vendor's customer sites. Single-source

maintenance can be achieved by offering the user a single maintenance contract that covers all of the products connected to a vendor's system, whether the products are the vendor's own or someone else's. The maintenance for foreign devices can either be accomplished directly by the system vendor itself or it can be brokered to the equipment's manufacturer.

- The advantages of single-source maintenance are:
  - Competitive service contracts with users are thereby eliminated.
  - Users can no longer make comparisons between foreign service and the vendor's own service.
  - Revenue increases (brokerage fees are typically a 10% markup of the actual cost of the foreign service).
  - The future potential of accomplishing the service itself (when the installed base density of such products is sufficient to support a service operation) is immediately safeguarded as an option (with a 10% bonus the markup can be continued).
  - The user need not know when the changeover from foreign service to direct service occurs; in any case the contract does not change, only the service source.
- One other attraction of the single-source maintenance market is that it is a market free from IBM (which will not offer service to another vendor's products). A number of vendors are planning moves in this direction, including DEC, NCR, and Honeywell.



#### D. PROFIT CONTRIBUTION OF FIELD SERVICE

- Despite the gloomy outlook for field service prices, the continued growth of field service revenue from other sources seems enough to offset the expected downturn in standard contract fees. The recession appears to be over and large-system shipments are improving. Productivity tools already in place (such as remote diagnostic tools) are capable of being applied to software maintenance as well as to hardware maintenance. Computer-automated spares control and dispatching promise further gains in cost control. Field engineer productivity is rising.
- The result is that the profit contribution expected from field service will increase steadily, providing healthy returns on the recent investments made in support centers, centralized dispatch facilities, and repair centers.
- Some corrective steps are immediately necessary:
  - Peripheral and terminal system vendors must improve their software maintenance services, which are currently not adequate; the way to do this is to increase software maintenance charges and to channel the revenue obtained into providing deeper support to end users, particularly in the form of remote tie-ins for diagnostics or the downline loading of corrected code.
  - Support should be focused in two areas:
    - Presale support: the responsibility of marketing, using the field service staff where appropriate (e.g., environmental planning and software/hardware configuration), but on a fee-paying basis (intracompany billing where necessary). This strategy includes the use of field service personnel for sales calls and goodwill visits.

- Postsales support: the responsibility of field services, using the salesforce where appropriate (e.g., for add-on sales, new models, and additional systems). Customer satisfaction should be the sole responsibility of the field service organization.

## E. PROFITABILITY TARGETS

- The total service concept mentioned above is instrumental in increasing field service revenues by offering new services to replace revenues lost due to declining hardware maintenance prices. Vendors that treat field service as a business have found the total service concept to be a major revenue source.
- Most vendors were reluctant to discuss the profitability targets of field service. Those that did respond said they expected profits in the 3.4%-8% range.
- Field service revenues represented between 6% and 30% of total revenue for the responding vendors. Clearly, this is a very significant portion of the average business. In addition, field service revenue is not as vulnerable to market fluctuations as is revenue for the rest of the industry.
- The importance of including field service development costs into the product sales price cannot be overemphasized. If development costs (e.g., documentation design and logistics planning) are not included in the original sales price, they must be recovered through maintenance revenues. Maintenance revenues then become inflated and third-party groups have an opportunity to pick up business.

## F. FIELD SERVICE IN MARKETING AND PRODUCT DEVELOPMENT

- As the industry moves away from the traditional methods of on-site maintenance and moves toward the concept of total service, field service departments must be prepared to accept greater responsibility for a variety of after-sales support services.
- Field service will expand to market upgrades and selected services. Whether field service retains its identity or is merged into another department such as marketing, is a decision many peripheral and terminal manufacturers will make in the next few years. Advantages of a merger include:
  - Complete support services offered through one department.
  - Greater efficiency in administration.
  - Expanded after-sales support services offered by field services.

## G. OPPORTUNITIES IN FIELD SERVICE

- Competition in field service is likely to intensify, as the result of two factors: the necessary reduction in on-site maintenance and the trend toward single-source maintenance. Independent corporations are already aggressively pursuing peripheral and terminal markets and, if unchecked, could make serious inroads in vendor field service revenues.
- Many peripheral and terminal users express the opinion that in many areas they are receiving a higher level of service than they require. By setting service priorities, vendors can shift available resources to concentrate on the maintenance areas that have the greatest potential to improve user satisfaction.

- The documentation being shipped to users definitely needs improvement. The opportunity here is to increase product sales by supplying effective documentation. Field service will be instrumental in generating effective documentation due to their knowledge of the users' capabilities and needs.
- Training and consulting are other areas that are in need of improvement. Over 30% of peripheral and terminal users surveyed were dissatisfied with training services. User satisfaction can be improved dramatically by customizing training to meet the individual user's needs. Field services is the natural source of this training because of its knowledge of the users' situations.
- Finally, users can benefit if field service becomes involved in such sales support functions as sales of supplies, upgrades, etc. Users typically oppose field service in a direct sales role, but field services support of sales is welcomed.

## H. AREAS OF CONCERN FOR VENDORS

- The following is a list of questions that will require upper-level managers' attention now or in the near future:
  - Should there be a slowdown in the movement toward user involvement in hardware maintenance?
  - How do we handle areas outside our support locations and still be competitive with the large-size vendors that already have support in these locations?
  - How can we price maintenance so that it does not jeopardize future profits?



- Should we offer product performance guarantees in the area of repair time and software fix turnaround time?
- Should we expand field service's role in the marketing of services and supplies?
- Can dealerships perform the necessary support functions to the satisfaction of personal computer users?
- Should the vendors in the office product sector of the systems business expand the user of third-party maintenance organizations?
- How will we deal with foreign add-ons and attachments when problems occur on our systems?
- Should we provide maintenance for local-area networks and for the products attached?



### III FIELD SERVICE OPERATIONS



### III FIELD SERVICE OPERATIONS

- The maintenance and service of peripheral and terminal equipment in the field in 1983 was characterized by two opposing trends on the part of vendors. On the one hand, vendors were making every effort to make service more convenient to users. At the same time, however, field service vendors were also trying to establish the field service operation as a profit center rather than a necessary expense. This chapter discusses the advances made by vendors on each front.

#### A. SERVICE DELIVERY MODES

- One approach to increasing customer satisfaction is to provide a variety of modes of service to meet customers' needs. On-site, carry-in/mail-in, and the use of remote diagnostics are among the different modes of service being offered.
- While a variety of service delivery modes may increase user satisfaction, a number of vendors reported that too much variety may also increase user confusion. Some alternatives, such as user self-maintenance, have not been accepted by users because of a high potential cost. For example: users must assign internal resources when problems develop and invariably users experience a loss of productivity. While vendors may project reduced overall costs, users see potentially higher maintenance costs and consequently resist new service delivery modes.

- The number of branch offices, sites with engineers, sites with remote diagnostic capabilities, and spare parts depots for selected peripheral and terminal service vendors is provided in Exhibit III-1.
  - The selected companies have an average of 73 branch locations, but only 57% have on-site engineers whereas 93% have spare parts depots.
  - Remote diagnostic capabilities have not been implemented by many of the vendors servicing this type of equipment.
- Field service employee counts for selected vendors are presented in Exhibit III-2. Some vendors service small and large systems, office products, and microcomputers, as well as peripherals and terminals, and many of these vendors' field service employees are not directly responsible for maintaining peripheral and terminal equipment. A workforce in the 3,000-4,000 range would be at the high end in terms of employees dedicated to peripheral and terminal field service.
  - An interesting aspect of staff deployment is the ratio of engineers to total field service employment. The best ratio (that is, the most engineers per total employment) was recorded by Delta Data, with 82% of their field service employees in the engineering ranks.
  - Some vendors appear to have an unusually high number of administrative workers.
- Exhibit III-3 depicts the changes from 1982 to 1983 in the average number of employees by function for peripheral and terminal maintenance vendors. In general, the number of supervisors, line managers, and other field service employees increased faster than the overall 7% employee increase rate.



# EXHIBIT III-1

## NUMBER OF LOCATIONS FOR SELECTED VENDORS

VENDOR	BRANCH OFFICES	SITES WITH ENGINEERS	SITES WITH REMOTE DIAGNOSTICS	SPARE PARTS DEPOTS
A	10	4	0	2
B	43	5	0	46
C	3	-	-	3
D	185	-	-	8
E	125	4	3	5
F	32	10	0	32
G	5	0	0	5
H	6	68	-	7
I	20	20	2	20
J	100	100	0	100
K	3	-	-	10
L	44	42	-	34
M	300	-	-	-
N	73	0	-	8
AVERAGE	68	18	<1	20

- = Do Not Offer

0 = Offer But Have No Sites

EXHIBIT III-2  
FIELD SERVICE PERSONNEL DISTRIBUTION BY  
FUNCTION AND VENDOR - 1983

VENDOR	EMPLOYEE COUNTS							
	FIELD SERVICES							
	Total Organization	Engineers	Technical Support	Supervisor	Line Managers	Administration	Other	Total
A	11,000	9	2	2	1	6	0	20
B	2,000	64	6	6	5	27	13	121
C	-	-	-	152	45	-	-	197
D	580	40	32	5	5	14	0	96
E	25	-	-	-	-	-	-	-
F	15,000	2,894	86	0	206	29	685	3,900
G	400	20	6	2	2	2	15	47
H	-	25	-	-	-	-	-	25
I	2,400	539	27	-	54	257	13	890
J	400	47	2	3	3	2	0	57
K	11,000	597	53	45	55	110	0	860
L	3,100	761	41	40	20	149	300	1,311
M	3,900	559	159	19	35	107	0	879
N	100	2	1	1	0	0	0	4
O	2,200	136	18	5	12	20	43	234
P	2,200	110	11	6	11	9	53	200
Q	1,200	400	20	40	-	10	130	600
R	1,400	9	2	1	0	3	1	16
S	125	17	2	1	2	1	0	23
T	52,000	1,754	332	372	148	1,694	0	4,300

# EXHIBIT III-3

## FIELD SERVICE PERSONNEL BY FUNCTION

FUNCTION	AVERAGE NUMBER OF EMPLOYEES		
	1982	1983	CHANGE (Percent)
Field Engineers	432	450	4%
Technical Support	45	45	0
Field Service Administration	133	143	8
Field Service Supervisors	37	44	19
Line Managers	28	34	21
Other Field Service	78	90	15
Total Field Service	753	806	7

Total Sample: 22 Vendors

- This may be a necessary adjustment for vendors that are moving field service operations to profit center status. However, increases in management ranks serve only to lower the productivity ratios of field engineers. Unless these new managers have definite servicing responsibilities, the number of staff additions must be reviewed.
- In addition to staff increases, many vendors also implemented - or plan to implement in the near future - additional services for customers, as shown in Exhibit III-4.
  - Remote diagnostic capabilities, infrequently provided by vendors in 1983, will enjoy a dramatic increase in use through 1985.
  - The growing importance of self- or remote diagnostics is highlighted in the importance ratings of various service modes by vendors, as shown in Exhibit III-5. These diagnostics are currently less important than on-site and telephone support, but will become more important as this capability is offered by more and more vendors through 1985.
  - Selling solutions, rather than technology, has become the focal point in vendors' marketing strategies. Vendors have keyed in on achieving customer satisfaction, and the quality of the maintenance service is central to the definition of satisfaction.
  - Customer satisfaction (in field service) centers around what happens when a customer's equipment is down. A remote diagnostic capability helps to achieve a higher level of customer satisfaction by:
    - Allowing for faster and more efficient downtime recoveries.
    - Resolving problems associated with multiple vendors.
    - Lowering the overall cost of service.

## EXHIBIT III-4

## SERVICES IMPLEMENTED OR PLANNED BY VENDORS

	IMPLEMENTED (Percent)	PLANNED FOR 1985 (Percent)
Centralized Dispatching	85%	100%
Real-Time Incident Reporting	75	100
Third-Party On-site Maintenance	73	70
Regional Repair Centers	62	100
Third-Party Repair Centers	45	60
Remote Diagnostics	38	92
Use of Modular Plug-in Units	38	77

SOURCE: 13 Vendors

EXHIBIT III-5

IMPORTANCE OF VARIOUS SERVICE OFFERINGS

SERVICE OFFERINGS	RATING*
On-site Field Support	8.78
Telephone Field Support	8.33
User Self-Diagnostics	6.11
Remote Diagnostics	5.56

Rating: 1 = Low, 10 = High



- Providing service and support for complex equipment configurations.
- Remote diagnostic capabilities are becoming more important to vendors because of the growing shortage of qualified field service personnel and the increasing number of dispersed customer installations.
- Vendors realize that designing and implementing remote diagnostic capabilities within their equipment can ultimately result in:
  - Reduced field service costs.
  - Higher field service profits.
  - Increased sales as customers perceive the value-added nature of having remote diagnostic capability.
- Vendors must show their customers that remote diagnostic functions will provide both improved service and reduced downtime costs.
- In addition to increasing customer satisfaction, remote diagnostic functions improve field engineer productivity.
- Use of remote diagnostics can shift some of the maintenance burden onto the customer by having him/her initiate diagnosis before field personnel arrive at the customer's site. This results in less travel to the customer's site. Presently, however, vendors are somewhat reluctant to give users responsibility for performing diagnostics.
- While the prevalence of remote diagnostics is inevitable, there is some danger inherent in offering it. Less travel to the customer's site by

field engineers will lower field service costs, but will also lessen the amount of direct contact the vendor has with the customer.

- Remote diagnostics will improve system performance, but they may actually lower overall customer satisfaction, e.g., through less vendor visibility and handholding. Vendors realize the importance of customer contact and are devising new approaches for maintaining it.
  - Likewise, service will be increased by the manufacture of hardware that has more modular plug-in units that are easily changed in the field (even by the user) and by the addition of more regional repair centers that allow the customer to carry in the peripheral or terminal for faster service.
- As noted above, vendors must be careful to judge accurately the users' attitudes toward service delivery modes. Exhibit III-4 indicates that 92% of vendors plan to implement remote diagnostics by 1985. Vendors who then expect their users to initiate diagnostic procedures or replace failing modules may find that they are inviting competition from third-party maintenance organizations that offer more complete services to the user.
  - Centralized dispatching from a single headquarters location, real-time incident reporting, and third-party maintenance contracts are currently used by approximately three-fourths of the responding vendors. The former two services will be offered by all of these vendors by 1985. The number of vendors offering third-party maintenance will also increase steadily in the foreseeable future.
  - The secondary, or ancillary, services offered or planned by selected vendors are highlighted in Exhibit III-6.
  - The greatest increases in the number of vendors offering service are for software consulting and add-on sales. The lowest levels of implementation that will not change by 1985 include software sales and hardware consulting.

# EXHIBIT III-6

## SECONDARY SERVICES IMPLEMENTED OR PLANNED

SECONDARY SERVICES	IMPLEMENTED (Percent)	PLANNED (Percent)
Customer training	88%	93%
Installation management and coordination	88	93
De-installation	88	93
Supplies sales	73	80
Physical site plan- ning (layouts)	67	71
Facility relocation	69	80
Upgrade sales (new equipment or features)	63	67
Site audits	56	67
Add-on sales (addition- al equipment)	56	73
Consulting services (software)	40	57
Environmental planning	38	53
Consulting services (hardware)	38	40
Software sales	36	38

- A different view of software consulting may be seen in the analysis of the level of hardware and software integration by field service vendors, as shown in Exhibit III-7.
- Some vendors did not respond to the question of integration so, presumably, it is not being considered by these vendors. Of those that did respond, over one-half indicated an integrated approach in both systems and application software areas. Only third-party arrangements were not being integrated by many of these vendors.
- The level of integration, however, indicates that only compilers and system utilities have crossed the 30% integration level. By 1985 integration of compilers and systems utilities will have reached the 50% level.
- Finally, these pressures on field service vendors to be profitable and increase the satisfaction level of customers have created new vendor service offerings. The level of implementation of these offerings in 1983 and 1985 are depicted in Exhibit III-8.
  - Services currently offered by many vendors are guaranteed responsiveness, on-site spares, and deposit maintenance.
  - System software maintenance service and local-area networking are likely to be the fastest increasing offerings by vendors.
- As the users' level of technical expertise increases, there will be a corresponding increase in demand for different types of maintenance. Some users will demand full, on-site service, while others will prefer to be involved in the maintenance of their own equipment. Vendors should provide a complete menu of available services that will give the user the opportunity to select service based on need. This type of menu has been initiated by some

## EXHIBIT III-7

LEVEL OF INTEGRATION OF SOFTWARE SUPPORT  
WITH HARDWARE SUPPORT

SOFTWARE SUPPORT ACTIVITY	FREQUENCY OF VENDORS INTEGRATING (Percent)	LEVEL OF INTEGRATION (Percent)	
		1983	1985
System Control Program (Headquarters)	86%	22%	49%
System Control Program (Field)	83	16	40
Compilers and System Utilities (Headquarters)	86	34	50
Compilers and System Utilities (Field)	57	31	41
Applications Software (Headquarters)	67	19	39
Applications Software (Field)	50	12	22
Third-Party Software Maintenance (Headquarters)	33	2	10
Third-Party Software Maintenance (Field)	33	2	10

SOURCE: 7 Vendors

## EXHIBIT III-8

## SERVICES IMPLEMENTED OR PLANNED BY VENDORS

	IMPLEMENTED	PLANNED
Guaranteed response time	94	100
On-site spares	88	88
Depot maintenance (carry/ mail)	88	100
On-site standby	76	75
Variable shift coverage (versus fixed schedules)	69	73
Preventive maintenance and field changes during non- prime hours	65	69
Guaranteed availability (uptime)	56	67
Depot maintenance (pickup)	53	75
Local area network maintenance	47	75
System software maintenance	38	73
Application software maintenance	31	47
Guaranteed repair time (hardware)	29	38
Facility maintenance management	24	31
Guaranteed turnaround on software repairs	19	33



vendors already - DEC, for example - and it will serve to protect the vendor's installed base from third-party competition.

## B. PRODUCTIVITY

- In addition to offering a variety of service modes to increase profitability, vendors are also asking their employees for greater productivity.
- Productivity is frequently measured by gross revenue per employee, or by the ratio of net expenses to revenue. Less frequently, productivity is measured by the number of total personnel to the number of managers and by the number of employees to pieces of equipment. Details are shown in Exhibit III-9.
- Productivity measurements, as listed in Exhibit III-9, are considered necessary from the vendor's administrative point of view, but often ignore such qualitative factors as customer satisfaction. To be truly effective, performance measurements must include financial, productivity, and quality assurance criteria. In addition, an effective reporting procedure must be instituted to measure productivity.
- Measures of revenue per employee for reporting vendors are supplied in Exhibit III-10. On average, productivity declined by 23% for field engineers and by 18% when all field personnel are included in the calculation. Dramatic losses in productivity rates by two vendors, coupled with unspectacular gains by many of the other vendors led to the poor overall showing. Only two vendors indicated increases in productivity in the 14% range, the highest level of those reporting.
- While productivity as measured by revenue per employee did not significantly increase for peripheral and terminal service vendors, productivity improvements were realized in other areas, as shown in Exhibit III-11.

# EXHIBIT III-9

## METHODS OF MEASUREMENT OF CHANGE IN PRODUCTIVITY

MEASUREMENT	FREQUENCY OF USE (Percent)
Gross Revenue/Employee	93%
Net Expenses to Revenue (after cost of improvement)	93
Personnel/Manager	53
Personnel/Equipment Category	47

SOURCE: 15 Vendors

EXHIBIT III-10

PRODUCTIVITY OF FIELD SERVICE PERSONNEL BY VENDOR

VENDOR	PRODUCTIVITY			
	FIELD ENGINEERS		TOTAL FIELD SERVICE	
	Revenue/ Employee	Change (Percent)	Revenue/ Employee	Change (Percent)
A	\$ 80,857	4%	\$60,000	11%
B	100,735	0	58,547	5
C	93,000	3	51,150	10
D	80,210	0	46,565	2
E	76,404	14	63,000	18
F	112,500	(36)	46,875	(33)
G	83,871	14	48,372	10
H	44,118	(26)	32,609	(29)
I	104,688	( 1)	55,372	8
J	103,041	2	65,529	2
K	147,092	8	60,000	8
L	71,500	4	47,667	2
Weighted Average	\$ 82,126	(23%)	\$49,068	(18)

## EXHIBIT III-11

## AREAS OF PRODUCTIVITY IMPROVEMENT

PRODUCTIVITY AREAS	TARGETING AREA FOR IMPROVEMENT (Percent)	REALIZING IMPROVEMENT (Percent)	RANGE OF IMPROVEMENT (Percent)
Repair Centers	47%	100%	5-30%
Field Education	40	100	10-60
Cross-Training	47	86	5-33
Regional Parts Depots	40	83	5-30
Support Centers	47	71	5-40
Remote Diagnostics	33	60	10-15
Centralized Dispatch	40	33	20-34
Multiple Territory Assignments	33	20	N/A

- The degree to which each productivity area is targeted by respondent vendors ranges from 33% to 47%, the most popular being repair centers, support centers, and cross-training.
- Of those vendors that targeted one or more of these areas for productivity improvement, most actually experienced improvement. Repair centers and field education improvement targets paid off for all vendors. To a lesser extent, improvement was realized by vendors that targeted cross-training, regional parts depots, support centers, and remote diagnostics. Only centralized dispatching and multiple territory assignments yielded productivity improvements for fewer vendors than tried them.
- Improvements in productivity through these new strategies ranged from 5%-60%, with the field education improvements by one vendor generating a 60% increase in productivity.
- There are differing opinions on the productivity of field service performing depot repair. As products become more modularized and test equipment more extensive, it is generally agreed that manufacturing should be responsible for parts repair, while field service should coordinate parts availability.

#### C. SPARE PARTS DISTRIBUTION, CENTRALIZED DISPATCH, AND PARTS RETURN

- As field service is viewed increasingly as a profit center, cost control will get more of management's attention. Typical problem areas encountered in field support inventory are shown in Exhibit III-12.

## EXHIBIT III-12

### PERIPHERALS AND TERMINALS: TYPICAL FIELD SUPPORT INVENTORY PROBLEM AREAS

INVENTORY
Lack of Timely and Accurate Data on Stock Levels
Insufficient Use Tracking
Poor Stock-Level Forecasting

REVENUE
Poor Control over Giveaways by Field Personnel
No Return Incentive for Loaners to Customers
Inaccurate and Late Service Reports for Billing
Lack of Clear Parts Warranty Policy
Inadequate Costing Methods for Carrying and Obsolescence Charges

RESOURCE MANAGEMENT
Insufficient Control over Spare Parts Distribution and Replenishment
Frequent Parts Unavailability on Service Calls
Poor Tracking of Part Performance and Problems



- The logistics of spare parts planning, now more than ever, presents a challenge to field service management. Spares are obviously necessary to proper maintenance and, with machine proliferation, represent a substantial capital investment. While a few vendors reported a planned reduction in future expenditures in spare parts, most peripheral and terminal vendors are planning for rapid (up to 50%) growth in capital investment in spare parts.
- In an attempt to control inventory costs, management is looking toward the computerization of spare parts distribution and dispatching functions. When installed, these systems have increased cost control by:
  - Substantially reducing emergency shipments.
  - Increasing inventory turnover rates by reducing the number of parts ordered.
  - Increasing the productivity of field engineers by reducing travel time and the occurrence of parts unavailability on service calls.
  - Reducing the paperwork associated with inventory control.
  - Providing a mechanism for tracking returned parts, starting with their return from customers, through their repair and then return to warehouse.
  - Providing better forecasts of the demand for parts.
- The average spares investment for those vendors surveyed equals 35%-40% of the gross service revenues for 1983. Vendors strive to achieve the lowest possible sparing levels - usually in the 4%-7% range - without adversely affecting customer satisfaction.
- Field engineer dispatching may be either centralized or decentralized.

- Centralized dispatching implies that dispatchers are at a single location. Field engineers are notified of calls from this location and then report back the disposition of calls to this dispatch center.
  - Dispatchers control specific service territories from a central location.
  - Dispatchers have access to the national data base.
  - Any dispatcher can handle any failure or can contact any field engineer.
- Decentralized dispatching places the dispatcher in field offices. Dispatchers are physically located within their service territory.
- Exhibit III-13 compares the various dispatching schemes.
  - Centralized dispatching works best for organizations of up to 300 field engineers.
  - Regional dispatching is appropriate for midsize organizations (300-800 field engineers).
  - Decentralized dispatching offers advantages for the large field engineering organization.
- Dispatching is often slightly modified by vendors to include a hotline or support service. Vendors report a very favorable reaction from users when these services are affiliated. User satisfaction is increased because:
  - Vendor response time is seen by the user as being immediate.

# EXHIBIT III-13

## COMPARISON OF DISPATCH METHODS

OPERATIONAL CRITERIA	DISPATCH ALTERNATIVES		
	BRANCH	DISTRICT	CENTRAL
Field Management Control of FE	High	Moderate	Low
HQ Management Control of Daily Operations	Little	Moderate	Considerable
Call Escalation (Alert) Procedures	System alerts in sequence: Area/branch office, district office, regional office, headquarters	System alerts dispatcher who contacts area/branch office and subsequently district manager. Regional office and headquarters are alerted by FEs.	System only alerts dispatcher, dispatcher alerts in sequence area/branch office, district office, regional office, headquarters.
Ability of District Management to Affect Customer Satisfaction	Good	Very Good	Poor
Ability to Calm Irrate Customer	Very Good	Good	Poor
Awareness of Local Conditions Affecting FE Dispatching	Good	Fair	Poor
Knowledge of Customer	Good	Good to Fair	Fair to Poor
Response of Dispatcher to FE Question	Fast: Branch Phones are Continually Staffed	Fast: District Phones are Adequately Staffed	Fast: Large Number of Dispatchers
Hardware & Communications Cost	High	Low to Moderate	Low
Off-hour Dispatch	Poor	Poor to Good	Same as Regular Shift
Protection from Loss of Dispatch Center	Adjacent Area Assumes Lost Center's Activity	Redundant Hardware	Redundant Hardware
Manual Backup	Easy	Moderate	Very Difficult

- Machines are often repaired faster because of user involvement in diagnosis or repair.
- Given the advantages of centralized dispatch, it is not surprising that a majority of peripheral and terminal vendors will be employing centralized dispatch by 1985.
- Several methods are now used to control the return of spare parts. Some vendors have established elaborate tracking systems that provide continuous control over all parts movement. Other vendors rely on the FE to keep track of spare use. Whichever method is used, inventory buildup will result from poor parts management.

#### D. PRODUCT PERFORMANCE

- The key user requirement that field service managers must satisfy is that of system availability, defined as:

$$\frac{\text{Scheduled Use}}{\text{Actual Use} + \text{Downtime} + \text{Recovery Time}}$$

- System availability includes software failures (both systems and applications software) as well as hardware failure, and is the users' view of system performance. The vendor's view frequently does not take into account recovery time and often considers downtime as starting when the field service organization is notified of a failure, rather than when the actual failure occurred.
- As shown in Exhibit III-14, most vendors are meeting their objectives for peripheral and terminal availability and exceeding user expectations at the same time. However, MTBF numbers indicate that the 1983 rating for equipment fell some 400 hours short of the objective. Considered separately, the

EXHIBIT III-14

SYSTEM AVAILABILITY AND  
MEAN TIME BETWEEN FAILURE: RESULTS OF  
SELECTED PERIPHERAL AND TERMINAL MAINTENANCE VENDORS

MEASURERS	CURRENT AVERAGE		USER EXPECTATIONS	OBJECTIVES
	1982	1983		
System Availability (in Percent)	96%	96%	92%	96%
Mean Time Between Failure (Hours)	5,389	5,814	N/A	6,244



MTBF objective for printers exceeded the actual rates and CRT failures occurred approximately 1,000 hours before expected.

- The mean time to respond decreased dramatically in 1983; it was well below both user expectations and company objectives. This suggests that some service money may be spent needlessly by vendors since users are receiving a response well in excess of their actual needs.
- Repair time is defined as the time between the moment an engineer begins to work on the problem and the moment when the problem/failure is repaired. Most peripheral and terminal service organizations are either meeting or beating their objectives, as shown in Exhibit III-15. The MTTR figure for peripherals and terminals was 0.7 hours in 1983.

#### E. HANDLING REMOTE CUSTOMERS

- Remote customers are typically served by one of two methods: an FE travels to the user's site and charges a preestablished service premium, or the vendor uses some form of remote diagnostics. Considering the growth in geographic distribution of equipment, it is probable that handling remote customers will become a crucial issue in the future.
- When an FE is dispatched to a remote site, vendors usually charge a premium or zone charge. The premiums range from 20% to 80%, depending on how far the remote site is from the vendor's service center. In addition, response time guarantee charges are usually increased when applied to remote site contracts.
- Large peripheral/terminal manufacturers have a distinct advantage in this marketplace due to the large number of support locations. Other vendors must establish a service network through agreements with independent agents

# EXHIBIT III-15

## RESPONSE AND REPAIR TIME FOR PERIPHERAL AND TERMINAL SERVICE

MEASURE (Hours)	CURRENT AVERAGE		USER EXPECTATIONS	OBJECTIVES
	1982	1983		
Mean Time to Respond	9.0	6.0	12.0	10.0
Mean Time to Repair	1.5	0.7	N/A	1.1



if they are to compete with the larger and more established vendors. Smaller vendors may also choose to use remote diagnostics to support remote customers.

#### F. FIELD AUDITS

- In 1983, a majority of peripheral and terminal vendors have instituted a formal field audit program. The programs are very individualistic; no vendor has a program exactly like any other. Vendor field audit programs range from:
  - A specialist traveling with a field engineer.
  - Spot checking of IRs.
  - Callback measurement.
  - Factory checkout of deinstalled equipment.
- Complete field audits are difficult today, vendors report, because of the distribution and volume of equipment. Vendors interviewed by INPUT found that random surveys were most effective when used in conjunction with the checkout of deinstalled equipment.

#### IV FIELD SERVICE BUSINESS MANAGEMENT ANALYSIS



#### IV FIELD SERVICE BUSINESS MANAGEMENT ANALYSIS

- This section provides a review of the revenue and expense aspects of field service that is performed by vendors of maintenance for peripheral and terminal equipment.

##### A. FIELD SERVICE REVENUE

- The field service revenue generated by vendors is listed in Exhibit IV-1.
  - Three vendors - IBM, Burroughs, and Xerox - account for 90% of the field service revenue listed and 89% of the information services revenue reported.
  - Sixty-two percent of the revenue was derived from the U.S. marketplace.
  - On average, each vendor generates \$325 million in field service.
  - Of this group reporting revenue, Decision Data receives the largest share of its revenue from field service, while Beehive and ITT Courier show the lowest percentage of total revenue from field service operations.

## EXHIBIT IV-1

PERIPHERALS AND TERMINALS:  
KEY VENDOR 1982 SERVICE REVENUE

Company	Worldwide Information Systems Revenue (\$ Millions)	Estimated Worldwide Field Service Revenue (\$ Millions)			Field Services Growth Rate (Percent) 1981-1982	Field Service as Percent of Total Revenue 1982
		U.S.	Foreign	Total		
Centronics	\$ 113	\$ 6	\$ 3	\$ 9	8%	8%
Control Data	3,301	236	49	285	11	9
Decision Data	74	17	5	22	24	30
IBM	34,364	2,276	1,581	3,857	18	11
ITT/Courier	600	31	16	47	20	8
Burroughs	4,186	618	416	1,034	23	25
MDS	334	29	16	45	5	13
NAS	236	41	7	48	30	20
STC	1,079	66	36	102	52	9
Telex	208	29	10	39	9	19
Xerox	8,456	549	296	845	6	10
Beehive	32	3	1	4	12	13
Totals	\$52,983	\$3,901	\$2,436	\$6,337	17*	12*

\* Weighted Average

SOURCES: 1982 Annual Reports, 10-Ks, INPUT Estimates

- Field service vendors, on average, derive 12% of their total information systems revenue from maintenance. Much of that revenue is from maintenance contracts. Fifteen percent or less of total field service revenue comes from part sales and repair or direct labor charges, as shown in Exhibit IV-2.
- Exhibit IV-3 provides an indication of the number of vendors that receive revenue from various sources. In general, hardware maintenance and installation fees are revenue streams for 90%-100% of the vendors. Software maintenance, credit for special maintenance, and sales of supplies are revenue sources for just a few vendors.
- As products become more modularly designed and as users replace the modules when defective, hardware maintenance revenues as a percentage of the installed base will decline. Users also express dissatisfaction with the need to pay for software maintenance. By selling an overall maintenance contract covering all malfunctions and by offering an increased number of field services, revenues could be held to existing levels and labor used more efficiently.
- Many peripheral and terminal vendors are using third-party organizations to provide service to at least some of their users. These vendors face a threat of potentially reduced revenues if the third-party organizations expand to capture a greater share of the market. Independent parts/repair depots and independent education companies are growing rapidly and could have an adverse effect on vendor field service revenues.
- Some vendors have noted the expanding role of third-party organizations and have countered this growth by expanding the role of field service. This expansion typically includes increasing levels of after-sales support. Vendors recognize that expansion will not only increase revenue, but will also improve customer satisfaction and reduce the impact of third-party maintenance.

EXHIBIT IV-2

PERCENTAGE OF FIELD SERVICE REVENUE  
FROM VARIOUS SOURCES

SOURCE	RANGE (Percent of Revenue)
Maintenance Contract	75- 96%
Parts Sales and Repairs	1-15
Direct Labor	2-10
Consulting	0-2
Third-Party	0-7



# EXHIBIT IV-3

## PERCENT OF RESPONDENTS RECEIVING FIELD SERVICE REVENUES FROM SELECTED SOURCES

SOURCE	PERCENT
Hardware Maintenance	100%
Installation Fees	89
Training/Documentation	78
Spares	67
Equipment Relocation	67
Supplies	28
Credits for Special Maintenance	17
Applications Software Maintenance	11
Systems Software Maintenance	6

SOURCE: 18 Vendors

## B. EXPENSE CONSTITUENTS

- The expense side of the financial picture indicates that the generally sluggish nature of the economy forced heavy burdens on vendors. These burdens have made it difficult for vendors to realize profits from their field service operations.
- Typically, field service expenses are divided into two categories: those required for product development and those needed for current product support. It is important to control these expenses separately or else labor costs will be distorted. Development costs, such as product design maintainability, documentation development, educational course development, and logistics planning, should be included in the product price. If these product development costs are included in the standard maintenance price, the vendor will find that third-party competitors will have a lower price. These (third-party) organizations do not have the R&D and development costs found in the vendor organization and thus can offer lower maintenance rates.
- One solution to the control of expenses is in the type of organization and reporting structure used by the vendor. Exhibits IV-4 and IV-5 indicate the different levels of control used by management in different companies.
  - Over 50% of the vendors surveyed indicated a single level of P&L control, while the remainder indicate two, three, or more levels of control.
  - The headquarters operation was frequently involved with P&L, regardless of the number and location of other control levels. Branch locations were second to headquarters in frequency of involvement.
  - The level of detail to which costs and revenue are tracked by these P&L locations also varied by vendor (in terms of the extent of the

# EXHIBIT IV-4

## LOCATION(S) OF P&L CONTROL FOR FIELD SERVICE

NUMBER OF LOCATIONS	LOCATIONS			
	Branch	District	Region	Headquarters
One	3	1		4
Two	1		1	
Three	1	3		
Four	1			

SOURCE: 15 Vendors

# EXHIBIT IV-5

## FREQUENCY OF LEVEL OF DETAIL TO WHICH COSTS AND REVENUE ARE TRACKED

LEVEL(S)	LEVEL OF DETAIL			
	Site	Customer	Product	Product Line
One	2		3	2
Two	1			
Two	1			
Two		1		
Two			1	
Three		1		
Four	2			

SOURCE: 14 Vendors

detail tracked). Generally, one level of detail - the product level - was used. Less frequently, the product line or site level was used.

- Regardless of how it was tracked, labor was a significant expense for peripheral and terminal service vendors.
  - Average salary ranges, as shown in Exhibit IV-6, indicate the expense associated with direct labor. With a range of between \$11,000 and \$52,000 per year, a typical office salary would be approximately \$23,700.
  - Labor, then, represents 25% of the cost of the typical fault call, as shown in Exhibit IV-7.
  - With an average increase of 19% in the cost of a typical fault call, the total increase in direct labor expense was reported to be 29%.
- Other significant costs included overhead (28%) and parts and materials (25%). For 1983 these costs increased less than the total fault call increase and seemed to be the result of overall price increases rather than the cause of increases.

### C. TREATMENT OF SPARE PARTS

- Capital investment, which has averaged 35-40% of gross field service revenue for peripheral and terminal maintenance vendors, should remain fairly constant, or possibly decrease in the near future.
- Improved diagnostic design and production techniques will improve system availability, while requiring a smaller spare parts inventory for this equipment.



# EXHIBIT IV-6

## AVERAGE SALARY RANGES BY FUNCTION

	AVERAGE YEARLY SALARY 1983	SALARY RANGE (\$ Thousands)
Trainee Engineer	\$16,000	\$11.0-18.5
Qualified Engineer	19,900	15.0-21.2
Senior Engineer	23,200	18.6-28.0
Software Support	24,200	24.0-37.0
Line Manager	32,800	26.3-52.0

# EXHIBIT IV-7

## COSTS ASSOCIATED WITH TYPICAL FAULT CALL

	1982		1983		PERCENT CHANGE
	(\$ Millions)	(Percent)	(\$ Millions)	(Percent)	
Direct Labor	\$ 31	23%	\$ 40	25%	29%
Travel Labor	20	15	24	15	20
Parts and Materials	35	26	40	25	14
Travel Expense	9	7	11	7	22
Burden and Overhead	39	29	44	28	13
Total/Call	\$134	100%	\$159	100%	19%



- Management techniques utilizing on-line computerized systems for spare parts distribution and dispatching will reduce physical inventory and the amount of capital investment needed to support it.
- Controlling spare parts has always been a difficult undertaking that has been complicated by the increasing volume of both vendor- and OEM-supplied spares. As a result, parts tracking has become very sophisticated, with extensive data bases and elaborate return/exchange policies.
- While a number of vendors reported that they treat parts as a potential revenue source, most vendors report a very small, if any, profit margin on spares. Field engineers will often lease spares free of charge. If a part is exchanged by the user, FEs will often accept a delayed return policy.

#### D. ADMINISTRATIVE ALLOCATIONS AND OVERHEAD

- Many of the peripheral and terminal vendors allocate administrative and overhead costs at a fixed percentage of total field service revenues. These functions are generally performed at the headquarters location. In recent years, a number of vendors have attempted to move some of these functions to field locations. The results have been less than satisfactory due to duplicating of effort and lack of consistent practices.
- In 1983 several of the field service functions have been merged with those of other administrative groups, such as marketing and sales. Centronics, for example, merged marketing, sales, and field service into one division. Centronics feels that this move will cut costs and improve overall service.
- The independence of peripheral and terminal field service divisions will be significantly reduced over the next few years. New support organizations will

be formed to provide maintenance, training, research, and after-sales support. Although this move will not be greeted positively by all departments, it will nevertheless keep administrative costs to a minimum.



## V INTERNAL/EXTERNAL COMMUNICATIONS



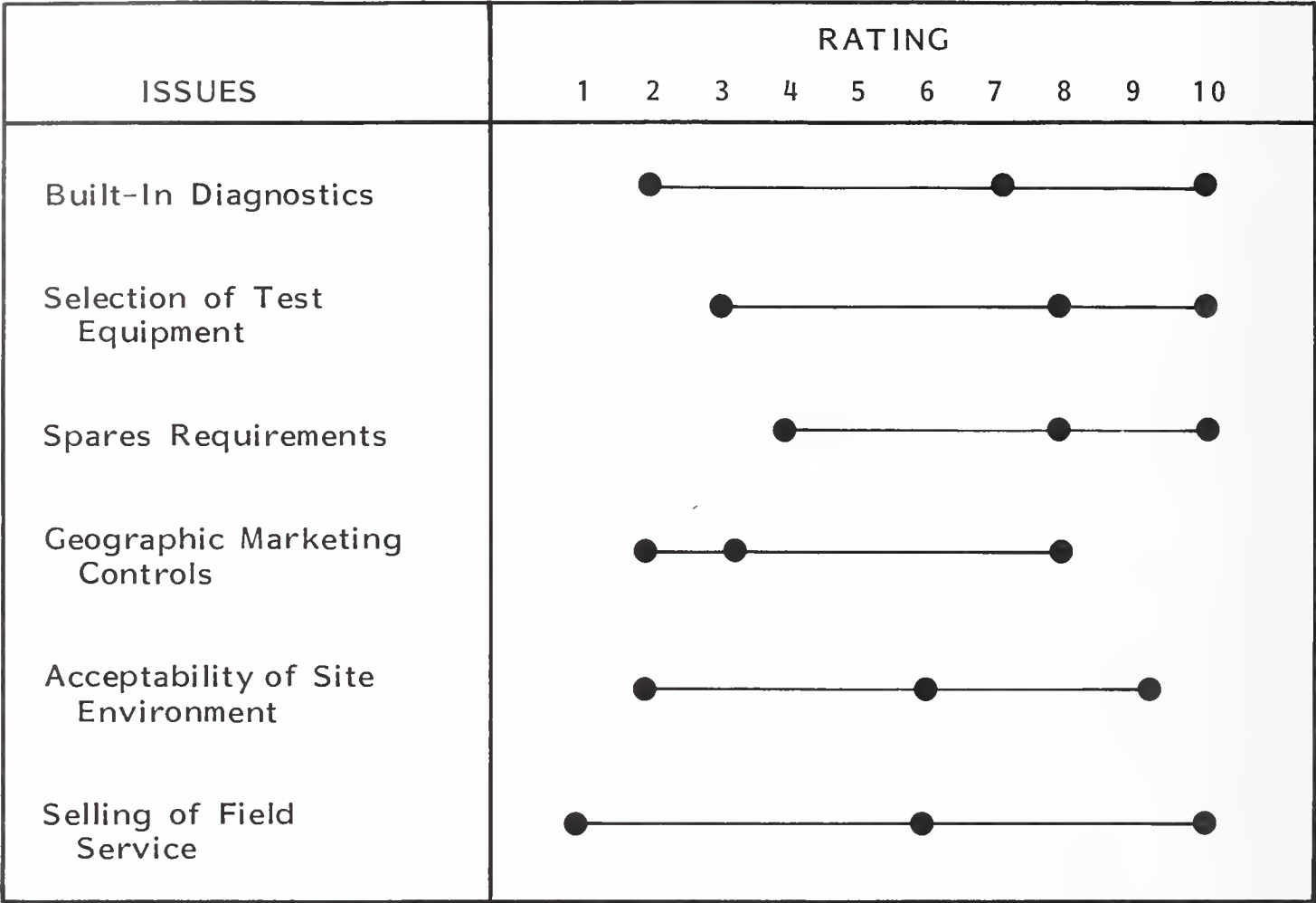
## V INTERNAL/EXTERNAL COMMUNICATIONS

### A. FIELD SERVICE INVOLVEMENT IN SALES AND MARKETING

- Vendors are beginning to view field service as a strong sales and marketing tool for winning new and repeat orders for peripheral and terminal equipment and maintenance.
- Users view the quality of field service maintenance as an indication of the vendor's confidence in the equipment. Features offered as a part of the peripheral and terminal sale, such as guaranteed uptime and embedded self-diagnostics, indicate that the vendor's confidence is high.
- Currently, field service engineers are part of the vendor's front line of communications with the user for such things as engineering changes, product features, and new products and services.
- While sales and marketing are not the primary responsibilities of field service engineers and managers, nevertheless field service personnel are being encouraged to perform more of these functions, as shown in Exhibit V-1. Only 21% of the vendors interviewed indicated that the company's sales organization had sole responsibility for the marketing and sale of field service. In most companies, then, these responsibilities are shared with the field service operation itself.

EXHIBIT V-1

FIELD SERVICE PERSONNEL INVOLVEMENT IN SELECTED ISSUES



Rating: 1 = Low, 10 = High

Center Bullet = Average



- Field service personnel have the most frequent contact with the customer. This trend should continue, but with less frequent customer contact because of the effectiveness of remote diagnostics and self-diagnostics. As remote diagnostics are used more frequently, field personnel will make fewer direct contacts with the user. For vendors, this poses a danger in that visibility in the eyes of the customer will be reduced. Vendors will need to find alternative approaches to keep their company in the mind of the customer.
- The field service engineer's knowledge of user equipment and frequent contact with the user puts the engineer in a unique position in the eyes of the customer, and this relationship can provide valuable feedback for management. Unfortunately, as Exhibit V-2 indicates, this information is not commonly solicited from the field organization by management (absence of reference to such activities). It is important that this valuable feedback be systematically collected, analyzed, and used in the business decision making of the vendor.
- As field service products begin to be packaged and sold, the field service representative is in the best position to know the customers' needs. But, since sales and marketing are not usually the strongest points of field service personnel, some combination of personnel or skills within the field service organization will be needed to ensure that the customers' needs are understood and the opportunities they represent to the vendor realized.

## **B. USER CONTACT**

- While customer satisfaction is the goal of every peripheral and terminal vendor, each has its own definition of what good service is and what it should be.

# EXHIBIT V-2

## SELECTED EMPLOYEE ACTIVITIES REQUIRED BY VENDORS NOW AND IN 1985

ACTIVITIES	VENDORS REQUIRING (Percent)	
	1983	1985
Making Goodwill Calls	63%	86%
Accompanying Sales Personnel on Calls	50	86
Selling Maintenance Contracts	43	50

- Regardless of the various meanings of customer satisfaction, the primary means of achieving it is to know what the customer wants and needs and then provide it. This requires a thorough understanding of the customer's system, operations, and problems; this understanding can be obtained only by frequent contact and communication with key customer personnel.
- The user's decision to purchase equipment from the vendor is frequently based on the value of the support and service provided by the vendor, as well as on the capabilities of the equipment itself. The customer perceives the vendor's commitment to service and reliability as an indication of the vendor's confidence in the product.
- Frequent high-quality communications between vendor and user are crucial to a good relationship and must occur at several levels:
  - At the field engineer's level, which is the fundamental building block of the client's relationship with the vendor.
  - At the field service manager's level.
  - At the formal, written level, where the company must be seen to be flexible, responsive, and reasonable.
- Exhibit V-3 provides vendors' ratings of their success in meeting several user criteria for satisfaction. Both self ratings and expected user ratings are included, although the variance between self and expected user ratings is small.

# EXHIBIT V-3

## SELF AND PERCEIVED USER RATINGS OF VENDOR ACTIVITIES

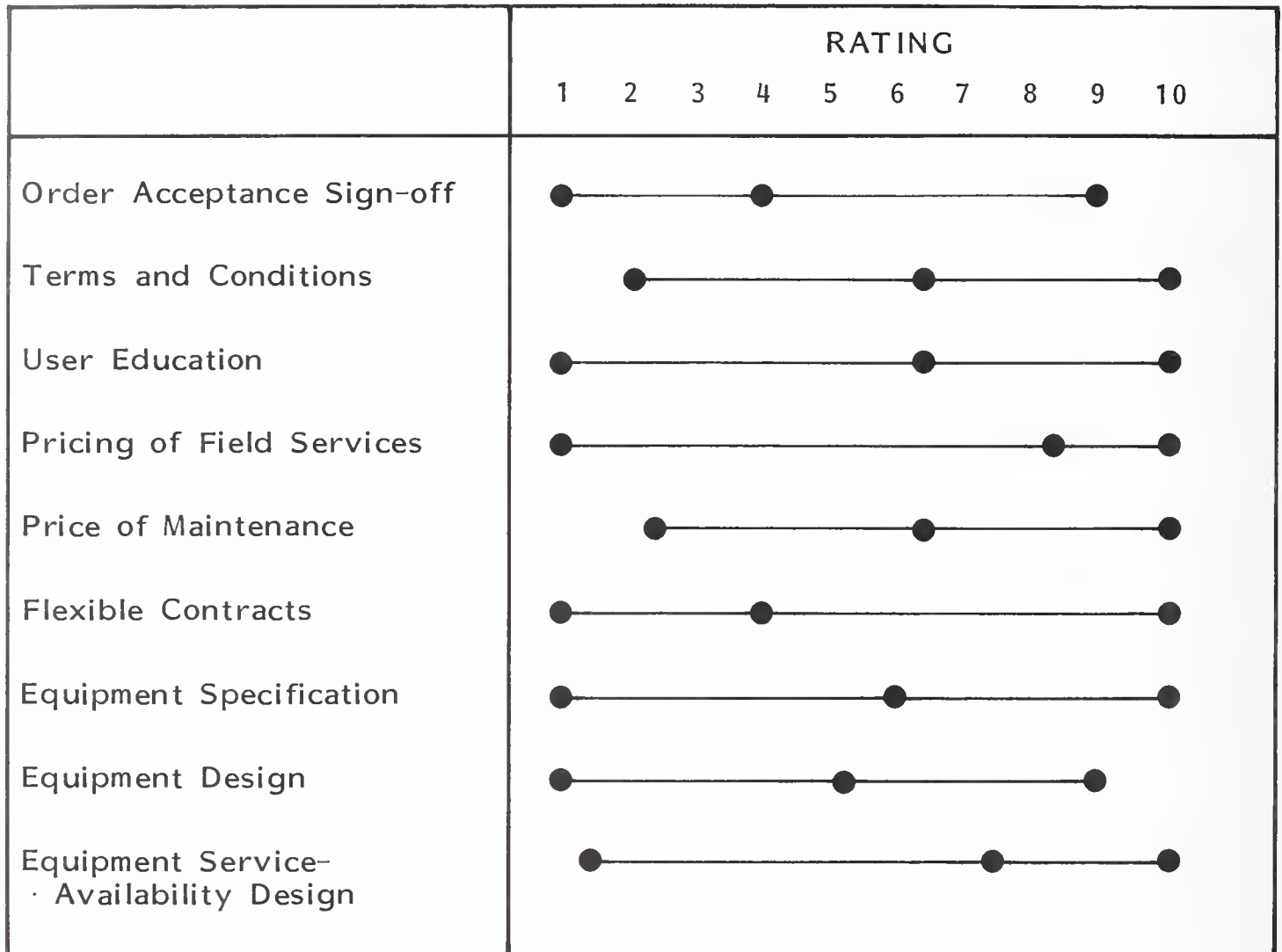
CATEGORIES RATED: (Service over the past 12 Months)	RATING (1-10)	
	SELF RATING	EXPECTED USER RATING
General responsiveness of the organization to user requirements	7.9	7.5
Dispatching trouble calls	7.8	7.9
Ability to diagnose hardware problems and to make quality repairs	7.4	7.5
Overall service image	7.1	7.3
Escalation procedures during extended outages	7.0	7.1
Hardware service engineers' communication	6.8	6.8
Resolution of invoicing disputes	6.6	6.3
Taking initiative to improve user operations	6.5	6.5
Management's communication with users	6.4	6.8
Software service engineers' communication	5.8	5.3
Ability to maintain software	5.0	5.3

## C. CONTRACT ADMINISTRATION

- The field service organization is becoming a more integral part of the overall corporate operation. As field service takes a more aggressive approach to sales and marketing, and continues to focus on providing customer satisfaction, it has also found itself more involved with the administration of contracts and the negotiation of terms and conditions. This is particularly true with the frequent exceptions to standard maintenance agreements.
- The field service representative, either engineer or manager, has an intimate knowledge of the customers' equipment and operation and has a unique advantage in evaluating particular service needs. This knowledge provides the engineer/manager with the ability to modify standard service contracts to suit each customer's particular needs. Exhibit V-4 presents vendors' ratings of their involvement in issues related to contract administration.
- Contract administration is presently handled by the vendor's sales or contract department.
  - While contract renewals should continue to be automatic (which generally simplifies paperwork), options should be kept open to modify standard contracts to suit a user's particular needs. This makes the user the recipient of special treatment and raises the customer's level of satisfaction.
  - Vendors should take advantage of the current preference for long-term contracts by customers. These provide a guaranteed stream of revenue.
  - Because of the field service representatives' ongoing contract with the customer, INPUT believes that the responsibility for contract renewal, negotiation, and administration should be shifted from the sales or

# EXHIBIT V-4

## RATING OF INVOLVEMENT IN SELECTED CONTRACT ADMINISTRATION ISSUES



Rating: 1 = Low, 10 = High

Center Bullet = Average

contract department to the field service organization. At a minimum, the field service department should play an active role in this function.

#### D. INVOICING AND COLLECTION

- A majority of vendors maintain a monthly invoice cycle. This is likely to continue in the future. Users do not seem to favor an annual invoicing procedure because of unfavorable cash flow implications and because of the interest lost when bills are paid in advance of service rendered.
- Although invoicing disputes are the responsibility of the administration group, disputes directly affect the image of the field service organization and have an impact on the relationship between field service engineer and customer. The field service organization should become more involved in the resolution of these disputes as part of their overall contract administration and customer satisfaction responsibilities.

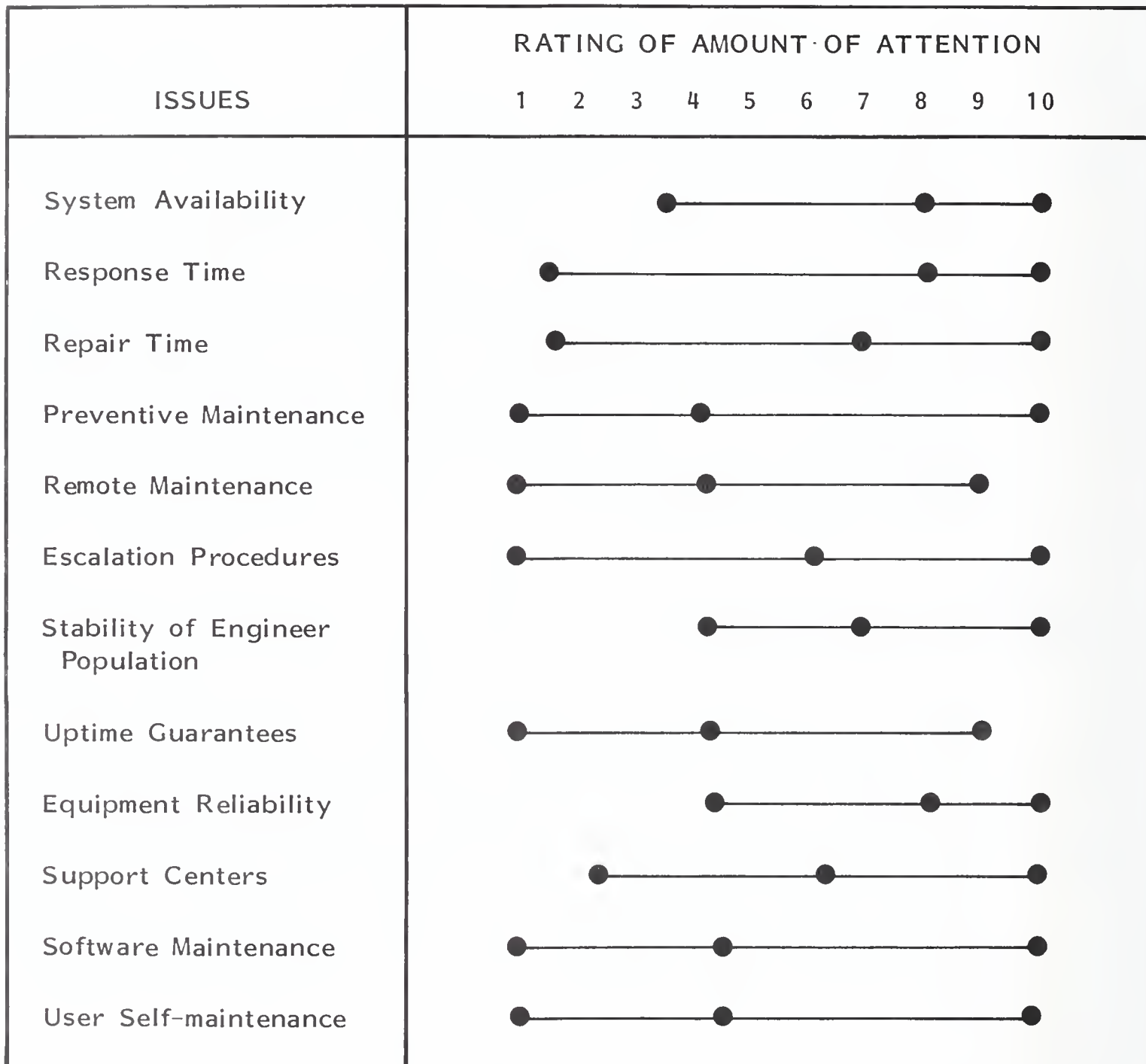
#### E. PRODUCT PROBLEMS

- Field service personnel have intimate knowledge of the vendor's equipment and how the customer is using that equipment. When product problems arise, field service is in an excellent position to communicate the problem to engineering/manufacturing and to provide assistance in both resolving the problem and testing the product before it returns to the field. How involved the field service operation really is is depicted in the involvement ratings in Exhibit V-5.
- One of the key elements in increasing field service productivity is the improvement of product design and of manufacturing quality control. It is in



# EXHIBIT V-5

## AMOUNT OF ATTENTION GIVEN TO SELECTED ISSUES



Rating: 1 = Low, 10 = High

Center Bullet = Average

the best interest of field service to provide assistance to these vendor functions whenever possible.

- Correcting or improving products before they ship to the field can save corporations millions of dollars. It is difficult to understand why most vendors are so concerned with shipping for the sake of revenues that will later be lost due to product support costs. Thus many experts accuse the computer industry of short sightedness.



## VI MAINTENANCE PRICING



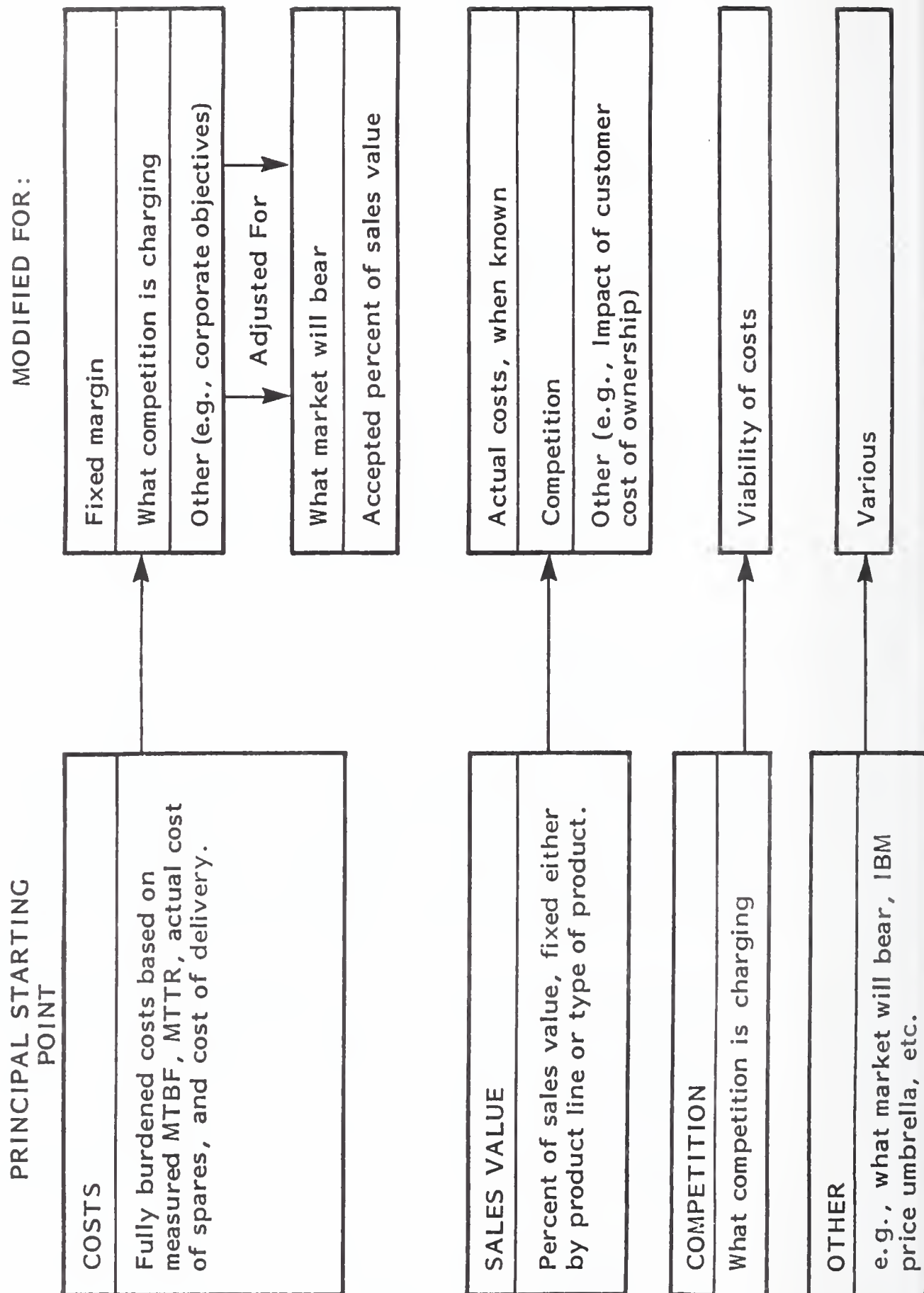
## VI MAINTENANCE PRICING

- Sound pricing practices based on solid marketing information are a source of significant revenue. Some of the pricing methods used by field service vendors are presented here along with information on price change policies, field service prices, and price elasticity.

### A. PRICING METHODOLOGIES USED

- While there is no straightforward method used for establishing the proper price for maintenance support of peripheral and terminal equipment, vendors do have information on which to base their decisions. Exhibit VI-I shows the various methods of establishing maintenance pricing.
- A thorough understanding of the competitors and their practices is a key determinant of pricing. Most vendors reported that they use competitive information when setting maintenance prices. Although this is understandable, it is a method that could result in a drain on profits - particularly if the competitor is basing maintenance prices on a different product performance objective.
- Costs of field service and profit margins are also factored into the maintenance price calculation. These considerations generally include the expenses for labor, travel, depreciation, spare parts, burden, and overhead.

EXHIBIT VI-1  
LARGE-SCALE SYSTEMS  
PRICING METHODOLOGY





- The maintenance and service track record can also play a part in determining whether a vendor can charge a premium for service or whether the vendor must offer a discount. The weighing of premiums and discounts must also take into account the following:
  - Mean time between failures.
  - Mean time to repair.
  - Mean time to respond.
  - System availability ratings.
- One additional factor used frequently by vendors is the cost of replacement of equipment. Obviously, in the customer's view, the cost of maintenance must be significantly less than the cost of buying a new piece of equipment to replace the failed component.

## B. FREQUENCY OF PRICE CHANGES AND RECENT TRENDS

- As reliability and life expectancy (now listed as five years by 71% of the peripheral and terminal vendors) increase, and the price of hardware decreases, users have become more resistant to service price increases on standard service contracts. This tendency will continue, with customers expecting service price decreases that are compatible with continued hardware price decreases and higher system reliability.
- While the basic hourly rate for field engineers increased 23% in 1983, as shown in Exhibit VI-2, many vendors did not change their rates, presumably in response to customer pressures to hold price increases to a minimum.

## EXHIBIT VI-2

## HOURLY CHARGE-OUT RATE FOR ENGINEERS

VENDOR	HOURLY RATE		
	1982	1983	CHANGE (Percent)
A	\$65	\$68	5%
B	60	66	10
C	65	65	0
D	60	60	0
E	60	66	10
F	58	72	24
G	60	70	17
H	37	40	8
I	65	70	8
J	110	121	10
K	60	60	0
L	75	80	7
M	185	185	0
Weighted Average	\$64	\$79	23%

- Vendors that base their maintenance prices on percent of replacement cost, or service costs and profit margins, tend to renew and change maintenance prices annually, if necessary. (One vendor did indicate that price changes were made every 24 months, while another vendor mentioned that the engineer's hourly charge-out rate is changed every six months).
- Those vendors who base their maintenance prices on competitive analyses are continually monitoring the competition and reacting as often as the logistics of price changes allow.
- With most vendors the notice period for price increases ranges from 30 to 90 days.

### C. DISCOUNTS RELATED TO ALTERNATIVE DELIVERY MODES

- Peripheral and terminal users are becoming reluctant to accept increases on standard maintenance contracts. In fact, customers have come to expect price decreases with continued high equipment reliability. To offset the expense increases field service vendors are experiencing, one or both of two alternative strategies may be employed.

#### I. DISCOUNTS

- One area that offers the potential for price reduction is discounting for alternative and less expensive modes of service. Exhibit VI-3 reviews some of these alternatives and provides information on vendors' use and discount structures.

# EXHIBIT VI-3

## DISCOUNTS OFFERED FOR SELECTED MODES OF SERVICE

DISCOUNT ITEM	OFFERS DISCOUNT (Percent)	DISCOUNT RANGE (Percent)
User Purchase of Spare Parts Kits	78%	10.0-40%
Use of Repair Center	71	5.0-65
Longer Response Time	57	5.0-25
User Replacement of Parts	33	5.0-15
Use of Remote Diagnostics	33	7.5-10

SOURCE: 15 Vendors

## 2. PREMIUMS

- Principal among the alternatives for generating additional revenue to offset the potential drop in basic contract revenue growth is the use of premiums for services that are valued by the customer and for which customers are willing to pay an additional amount (the premium).
  - One scheme is guaranteed uptime. This is a bonus in reverse: If the equipment does not provide uptime equivalent to a guaranteed minimum, the user pays nothing for service. However, if the uptime is exceeded, the vendor is rewarded with a bonus.
  - Standby coverage during critical periods is another popular premium.
  - The attraction of remote diagnostics may be worth a premium, but users are willing to pay only a small premium for it. Users see remote diagnostics as a productivity tool for the vendor, not as an additional benefit to the user.
  - Users would seemingly pay a small premium to have preventive maintenance and engineering changes accomplished during nonprime hours.
  - On-site spares may be attractive, but the average user has no desire to purchase them. However, the user is willing to pay a premium over the normal monthly maintenance charge to offset the vendor's costs of tying up money in idle inventory.

### D. SERVICE-RELATED PRICE ELASTICITY

- Very few service vendors carry out regular reviews of the service price elasticity of their product lines. This is a standard business technique applied

broadly in many other industries and has a value for every service manager that seeks to optimize service revenue.

- The usual approach is to establish a relationship between service pricing and potential revenue gain or loss (i.e., according to the potential impact on the user base). The main assumption is that all data elements (service quality, service contract options, etc.) remain constant.
- The price increase/lost client ratio is the only one that need concern field service managers. Managers should constantly be thinking of ways to increase prices while avoiding the loss of customers. This may be achieved in several ways:
  - Improving service to offset price increases.
  - Decreasing the service ability of alternative vendors (by making spares more difficult to obtain, for example).
- Price elasticity, as perceived by peripheral and terminal maintenance vendors, is presented in Exhibit VI-4. In general, elasticity is very low and very dependent on the equipment in question and on the reputation of the service provider.
  - Some vendors believe they will lose business if the maintenance price approaches 5-15% of the list price of the equipment.
  - The average point at which vendors felt customers would take alternative actions was at the 32-38% range. Interestingly, there was little difference between the various courses of action open to users. Most vendors seem to feel that when pushed beyond the 5-15% premium range, customers will have an extreme reaction that will go beyond considering alternative service vendors: when presented with this level of increase, customers would simply refuse to purchase the peripheral or terminal in question.

# EXHIBIT VI-4

## USER RESPONSE TO VARIOUS PERCEIVED LEVELS OF MAINTENANCE-TO-LIST PRICE

RESPONSE	MAINTENANCE-TO-LIST PRICE RATIO	
	RANGE (Percent)	AVERAGE (Percent)
User Considers Alternatives	5-100%	32%
User Uses Third- Party	15-80	38
User Refuses To Purchase Original Product	15-80	39





## VII VENDOR CASE STUDIES



## VII VENDOR CASE STUDIES

### A. DECISION DATA

- Decision Data recorded impressive growth in 1982 in both field services and overall revenues. While much of the industry was retrenching, Decision Data's 1982 revenues were up 48% to \$74 million. Growth was achieved primarily by increased product sales - particularly the company's CRT workstations - but there was also a substantial growth in service.
- 1982 revenues derived from maintenance were over \$22 million and represented 30% of the company's total revenues. Over the past three years, maintenance has been the fastest growing revenue source in the company.
- Growth in maintenance revenues is the result of three factors:
  - Increases in the company's installed equipment base.
  - Third-party maintenance.
  - Acquisition of companies providing computer maintenance services.
- Not only are revenues increasing, but Decision Data's field service operations are becoming more profitable. Cost of maintenance in 1980 was 105% of maintenance revenues. By 1981 this figure was reduced to 93%. In 1982 cost

of maintenance rose to 99% due to acquisitions, new products, training, and increased inventories. Field service expenses will continue to outweigh revenues through 1983, but the company should show a 4-6% profit on service revenue in 1984.

- The number of Decision Data field service customers increased from 5,500 in 1980 to 8,600 at the end of 1982 - an increase of 56%. During this same period, service staff has increased from 250 to 553. Of this 553, there are 300 field engineers operating out of 76 domestic service centers. The company also has about 40 field service employees in Europe.
- One of the major reasons for growth in Decision Data's field service revenues is their emphasis on third-party maintenance. This service was began in March 1980, and Decision Data now maintains a wide variety of peripheral devices for companies such as Olivetti, Texas Instruments, and Sony. In addition, Decision Data purchased a number of companies in order to gain the necessary maintenance skills on non-Decision Data equipment.
- Decision Data has indicated a great deal of flexibility in its third-party maintenance. Originally based around IBM peripherals, the company has expanded into other manufacturers' product lines (as noted above) and into the micro-computer market. A variety of services are offered, including on-site, carry-in/depot, and extended warranty work. INPUT expects third-party maintenance - particularly in small business/microcomptuer systems - will grow substantially at Decision Data.
- In order to promote third-party maintenance, Decision Data has announced innovative marketing/pricing plans. For example, in August 1983 the company announced the use of performance coupons in personal computer and peripheral maintenance. Under this plan users would get credit on the next year's maintenance contract for low use of maintenance in the current year.

- To support the expanding service network, Decision Data has established a sophisticated inventory control system. This system will produce inventory activity reports, customer billing problems, and maintenance schedules. The system will be installed by the end of 1983.

## **B. STORAGE TECHNOLOGY CORPORATION**

- Field service revenues are becoming increasingly important at Storage Technology Corporation (STC), particularly in light of their moderately poor sales performance in 1982. In fact, management at STC attributed overall 1983 revenue increases to gains made in service, particularly by expanding the customer base and charging higher service rates. Service and rental revenue increased 27% in 1983 to \$291.7 million.
- The majority of STC's revenues (52% in 1982) were derived from sales of disk drives. Thirty-five percent of revenues came from tape drive sales. Sales to end users represent almost 60% of STC's market and this is the fastest growing segment of their sales. Sales to both third-party users and distributors fell in 1982.
- STC expanded the number of field service engineers by over 30% in 1982. Currently, they have over 3,200 FEs and 630 marketing representatives and system engineers. While the company is understandably reluctant to disclose the profitability of its field service operations, it has stated that field service revenues exceed costs and that the operation is profitable.
- Maintenance contracts from STC generally reflect industry standards. The company offers three basic levels of services:
  - Prime shift. Normal, 8-5, Monday through Friday service.

- Total service. Twenty-four hours, seven days a week.
- Dedicated service. FE on user's site.
- Charges for maintenance are typically based on an initial prime-shift fee, plus additional fees depending on the level of service required by the user. In addition, the company offers per-call service on an hourly rate basis. Non-prime hours cost approximately 15% more per call than normal (8-5) service hours.
- STC has initiated two programs designed to improve maintenance and service:
  - Remote diagnostics.
  - Communications/Hotline Center.
- In 1981, STC initiated a Communications Center in order to work with users and provide telephone support. The company found that 75% of equipment malfunctions occurring within the first eight months were software and/or user related. The Communications Center was designed to diagnose the nature of the problem (hardware or software) and to dispatch an FE if necessary.
- The Communications Center has been successful because it involves the user and provides immediate support services. In cases where a minor software patch is required, the user may be asked to participate in the repair. Major software bugs and hardware problems are handled by an STC engineer. Regardless of who does the repair, user satisfaction is increased as a result of the user knowing that data integrity has been assured.
- The use of remote diagnostics figures prominently in the future success of the Communications Center. STC has designated remote diagnostics as an important component in current and future machine design. The 8380 disk



drive, introduced in 1982, has a remote diagnostics capability; the company has stated that all future products will have this feature.

- The company is committed to remote diagnostics for several reasons. First, geographic dispersion of equipment is increasing faster than the service network. For example, foreign revenues increased from 16% in 1979 to over 26% in 1982. As noted above, service staff has increased, but not in sufficient quantities to satisfy an increasingly dispersed customer base.
- The second reason STC has committed itself to remote diagnostics is the inherent efficiency of this capability. As noted above, a vast majority of initial problems in the machine can be solved if a central support group has remote access to diagnostics. In addition, when an FE is sent to a user's site, remote diagnostics will prepare the engineer to repair equipment quickly and reduce callbacks.
- Overall, STC is relying on field service to increase revenues during a period of product transition. Service revenues will grow in importance as the new product base grows and users demand increased services.

### C. CONTROL DATA CORPORATION (CDC)

- Control Data Corporation (CDC) had overall 1982 revenues of \$4.3 billion and a total staff of over 50,000. Engineering Services, the corporate field services division, maintains both CDC and non-CDC equipment. INPUT estimates that CDC's 1982 U.S. field service revenue was \$236 million, an increase of 9% over 1981.
- The Engineering Service division provides service in 73 U.S. cities. In addition to maintenance, these locations stock parts, maintain libraries, and offer consulting services.

- Peripheral devices are supported by approximately 55 of the 73 U.S. service centers. Some of these service centers also act as carry-in/ship-in depots for peripheral products.
- CDC's maintenance fees generally conform to industry standards. The company offers a variety of contracts and time/material rates to their customers. Extended maintenance is offered at an added percentage of the basic maintenance cost.
- Third-party and single-source maintenance have long been a goal of CDC's management. COMMA maintenance services, begun in 1969 and acquired by CDC in 1973, were originally designed to maintain IBM mainframe and plug-compatible peripherals. Today, COMMA has a staff of over 6,500 and is one of the largest maintenance organizations in the industry. COMMA continues to service primarily IBM products.
- COMMA typically maintains IBM, Data General, DEC, or other equipment that is tied to a CDC system. COMMA also maintains equipment on which CDC's OEM peripherals are installed (e.g., Altos and Emulex).
- CDC announced in January 1983 that it will maintain Spectra Logic Corporation's disk and tape controllers. In April 1983, CDC announced a value-added depot repair program - aimed at OEM customers - for certain peripheral products. Repair depots were to be established in California, New Jersey, Minnesota, France, and Sweden.
- In addition to the third-party maintenance of peripheral products, CDC has been innovative in other field service areas. For example, they have developed an extensive parts network - generally warehoused in the service centers - that has resulted in significantly improved repair times. The company has also developed an excellent in-house training program for field service staff. CDC Education Centers train FEs in both CDC and non-CDC peripheral service.

- Finally, Control Data has been a leader in cooperative service programs. For example, in 1983 CDC and NCR agreed to pool their talents in establishing a service center for computer-aided design (CAD) equipment. This particular center is designed to assist integrated circuit manufacturers, but CDC may use its extensive experience in third-party maintenance to offer other industry-specific service programs.

#### D. ITT COURIER

- ITT is a massive international corporation drawing much of its revenue from telecommunications-related equipment. Overall statistics of the corporation are impressive. Investment in research and development, for example, was \$1.1 billion. The company has 45 major research and development centers with over 23,000 engineers and scientists. Total revenues in 1983 were almost \$16 billion.
- ITT Courier is one of two data-processing-related subsidiaries of ITT - Qume Corporation being the other. Courier was acquired by ITT in 1978 and its products/services have expanded from display terminals to include controllers, modems, and third-party maintenance.
- Maintenance at Courier was, until recently, limited to its own products. The company has produced more than 200,000 terminals in its history and the extensive domestic service network was designed to service these products. Increased price competition for terminal maintenance has caused company officials to review this strategy and to consider alternative revenue sources.
- In 1982 Courier reduced its maintenance prices on IBM-compatible terminals, controllers, modems, and printers in response to a similar price reduction at IBM. In addition, Courier offered a 5% discount for prepayment on annual

maintenance contracts. As a result of this price competition, maintenance charges were reduced an amount that varied from 2-44%. Maintenance prices on controllers, for example, were reduced an average of 28%, and modem maintenance went down 26%. Time and material rates for noncontract customers have stayed constant at just over \$100 an hour.

- The second major change at Courier is its move into third-party maintenance. In late 1982, Courier announced a service agreement with Florida Computer Graphic Inc., a small graphics system manufacturer. Courier agreed to service FCG's equipment through Courier's more than 160 domestic field locations. After the agreement was announced, Courier said it was actively seeking more third-party contracts.
- In September, 1983 Courier signed another third-party service agreement. This time the agreement was with Ennision, a manufacturer of color terminals and printers. The agreement provided for nationwide on-site service to be handled out of the service centers mentioned above.
- Courier has indicated that a number of companies have expressed an interest in developing service agreements with ITT. INPUT anticipates rapid growth in Courier's third-party maintenance activities in the next five to seven years. In addition, Courier must remain competitive in terms of price if it is to avoid erosion of its customer base by other vendors offering single-source service.

#### E. CENTRONICS DATA COMPUTER CORPORATION

- Centronics is one of the oldest and largest manufacturers of printers. The company was begun in 1968 and by July 1982 had shipped over one-half million units. In 1981 and 1982, however, the company reported losses in net income of \$24 million and \$18 million (respectively). Revenues were up substantially (58%) in the first half of 1983 (to \$88.4 million). Increases resulted primarily from cost-cutting measures and improved sales.



- Financial difficulties caused major changes in all divisions of the company. Personnel has been cut back, and divisions were merged. Service was integrated into the Worldwide Marketing, Sales, and Service Operating Group. Management indicated that in addition to being a cost-cutting measure, this move reflected the company's philosophy of providing users with a single focus for support, both presales and postsales.
- There are approximately 100 field service locations worldwide. These locations provide on-site and walk-in service as well as depot repairs and parts distribution. Service facilities are located in the United States, Canada, England, France, West Germany, and Italy. In 1982, 47% of the company's sales were derived from foreign sources.
- The company has recently introduced a series of new product lines and this is assisting in Centronics' financial recovery. Extensive training programs have been initiated for service employees, international distributors, and major OEM customers. Control Data Corporation, which owns 35% of Centronics, is a major OEM customer with \$31 million in 1982 sales from Centronics.
- In addition to service training, the company has been innovative in other support functions. A computerized centralized dispatch center/hotline is available to customers via a toll-free service based in Hudson, New Hampshire. The service provides rapid maintenance information and, if necessary, dispatches an FE to the customer's site. The service department also maintains a sophisticated tracking system to monitor product performance.
- Centronics has recognized their customers' price sensitivities in several different ways. The company has about 20 carry-in service centers in the U.S. whose expressed objective is a five-day turnaround time. For customers who have the training to work on their own machine, the company offers spare parts kits and, as mentioned above, maintenance information via the hotline.

- In the past, Centronics has shown a substantial commitment to field service and this is expected to continue in the future. Integration of field service into the worldwide marketing group, increased FE training, and improved customer support techniques (e.g., centralized dispatch) will provide an excellent basis for field service profitability and growth in the future.

## VIII RECOMMENDATIONS AND CONCLUSIONS





## VIII RECOMMENDATIONS AND CONCLUSIONS

### A. USER REQUIREMENTS

- Peripheral and terminal (P/T) manufacturers are facing increasing competition in the field service market, particularly as the market becomes more lucrative. P/T vendors must formulate field service plans in order to consolidate their present customer base and, by offering new or expanded services, seek out new maintenance clients.
- The vendor must first identify specific user needs and then decide whether it is possible to meet these needs. For example, 40% of P/T users indicated they want preventive maintenance done during off-prime hours. The cost of the service does not appear to be compatible with a premium of 2.7% that the users were willing to pay. The vendor must bear in mind that user needs should be useful guidelines, not firm obligations.

### B. ACCOUNT CONTROL THROUGH SINGLE-SOURCE MAINTENANCE

- Single-source maintenance refers to one vendor taking the maintenance responsibility for all equipment at a user's site. For example, the CPU vendor might agree to service all the peripherals and terminals attached to the CPU. In some cases, P/T vendors have sought out an arrangement like this

due to the fact that the vendors didn't have enough staff to service all their clients. Vendors need to be careful not to allow too much growth among third-party or single-service operations.

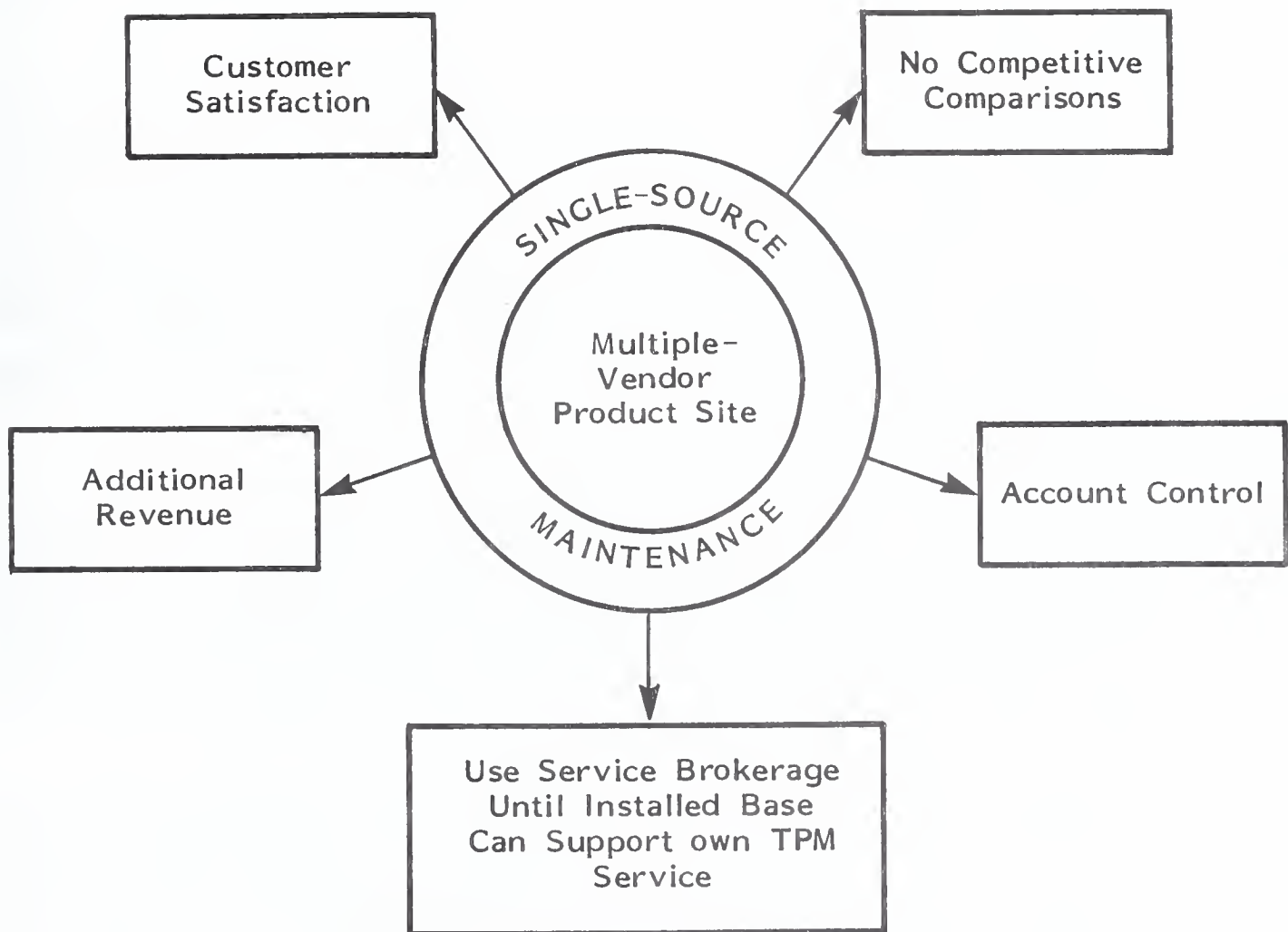
- The best method of keeping old service customers and attracting new ones is to offer maintenance services that will increase customer satisfaction. Vendors that offer a variety of service modes (e.g., carry-in, mail-in, etc.), in addition to standard on-site service, reported a high level of user satisfaction. In addition, a variety of service discounts, a liberal spares policy, and faster (usually centralized) dispatch will improve user satisfaction.
- The major advantage of maintaining a service customer base is that it provides the vendor with the option for future expansion into third-party maintenance of competitive equipment. Exhibit VIII-1 lists potential advantages of single-source or third-party maintenance. Advantages include:
  - Additional revenue (even if the foreign product service is only brokered, a 10% surcharge is usually levied).
  - Elimination of competitive service vendors.
  - Customer satisfaction.
  - Account control.

### C. SYSTEM AVAILABILITY GOAL SETTING

- One useful tool for developing an understanding of each user's service requirements is goal setting. This is a widespread practice in most aspects of today's business environment but one that vendors appear reluctant to implement with their user base. It should be made clear that the goals, once set,

EXHIBIT VIII-1

ADVANTAGES OF SINGLE-SOURCE MAINTENANCE



are not a contractual obligation between the vendor and the user, but a goal that each will strive to meet.

- The formulation of these goals must entail specific performance goals in terms that the user and vendor agree on. In this context it should be noted that the user often has a different definition of service measurements like repair time. (Users often refer to repair time as the time between failure onset and the system coming up; vendors carefully divide this period into at least response time and repair time, and sometimes eliminate from repair time the time needed to obtain a part).
- Perhaps the best goal that users and vendors can readily agree on is system availability (or scheduled use divided by total of actual use, downtime, and recovery time). This essentially puts a value on the question, "What do I, as a user, want my system to do for me?" The attraction is that it is far easier for the vendor to design a service contract which targets the users need, including special options (at a premium) which complement standard service contract provisions.
- The other benefit of such an activity is that it provides a forum for regular discussion between the user and the vendor on the performance of the system, the level of user dissatisfaction, the need for improvements, etc. Much of this dialogue is currently lost because of the lack of the opportunity for the user to express his or her needs.
- Vendor performance measures will be based in large part on field service staff productivity. In developing productivity measurement techniques, vendors must be careful not to rely too heavily on quantitative measurements such as mean-time-between-failure. Other factors such as quality assurance, customer satisfaction, and financial productivity must be included in order to judge staff productivity accurately.

#### D. REVISED MARKET SEGMENTATION

- It is customary for vendor organizations to segment their target markets according to some classical divisions:
  - Industry sector (e.g., banking, transportation, insurance, etc.).
  - Company size (e.g., Fortune 1000 companies).
  - Product market (e.g., minicomputers, small business systems).
  - Model (e.g., IBM 3081 market).
- When organizing market planning for field service it may make sense to consider a new set of market segments, e.g.:
  - Data dependence: where users are heavily dependent on the accuracy and/or timelessness of the data processed by a given machine, there is a tendency to concentrate more on the system's performance, rather than on the cost of service. Requiring service products that meet these performance goals is worthwhile since this will be a high-revenue opportunity area.
  - Visible-need maintenance products: these are products for which the user has a clear understanding of the need for maintenance (e.g., printers). These are generally high-use, high-performance devices that obviously need continuous monitoring and ongoing service to ensure maximum use (particularly since the accuracy of the output is essential to many applications).
  - Low failure/low dependency products: these are services that can fail without significant impact on the system's performance (e.g., a single

terminal); service to these devices can be accomplished off-line, via the temporary use of replacement terminals or bases. Service rates must be competitive for these devices. In general the idea is to isolate markets that require extra effort and contract design time, since the payback can be well worth the effort.

#### E. POSTSALES SUPPORT

- The benefits to be obtained from concentrating postsales support responsibilities with the field service organization may appear to be a revolutionary step. In actual fact it is nothing more than the extension of the concentration of service that was already begun with the integration of systems software support with the hardware maintenance function.
- The user benefits in that all requirements, needs, comments, and criticisms are channeled to the vendor through a single conduit: the FE (or perhaps more properly, customer service representative).
- The benefits to the company are the increased visibility of gains in its user base and the improved productivity of sales and service personnel, each of which now has clearly defined responsibilities.
- The drawback of such an approach is the (natural) reluctance of marketing to relinquish account control. This will mean that the move to total service will be long and sometimes painful, but inevitable in the long run.



## APPENDIX: QUESTIONNAIRE



## A. General Management

1. Please check all of the direct services you currently offer or plan to offer in the near future..

DIRECT SERVICE OFFERED	1983	BY 1985	BY 1987
a) Third-party maintenance	_____	_____	_____
b) Facility maintenance management	_____	_____	_____
c) Guaranteed availability (uptime)	_____	_____	_____
d) Guaranteed response time	_____	_____	_____
e) Guaranteed repair time (hardware)	_____	_____	_____
f) On-site standby	_____	_____	_____
g) Variable shift coverage (versus fixed schedules)	_____	_____	_____
h) On-site spares	_____	_____	_____
i) Guaranteed turnaround on software repairs	_____	_____	_____
j) Remote diagnostics	_____	_____	_____
k) Preventive maintenance and field changes during nonprime hours	_____	_____	_____
l) System software maintenance	_____	_____	_____
m) Application software maintenance	_____	_____	_____
n) Depot maintenance (pickup)	_____	_____	_____
o) Depot maintenance (carry/mail)	_____	_____	_____
p) Local area network maintenance	_____	_____	_____

2. Please check the ancillary services your field service organization offers or plans to offer in the near future. Also, for those services you currently provide, please indicate the level of quality you believe that your users would give you. (Scale of 1-10: 10 = excellent, 5 = average, 1 = very poor.)

ANCILLARY SERVICES OFFERED	BY 1985	BY 1987	1983	ON A SCALE OF 1-10, USERS WOULD RATE YOU
a) Environmental planning	_____	_____	_____	_____
b) Physical site planning (layouts)	_____	_____	_____	_____
c) Consulting services (hardware)	_____	_____	_____	_____
d) Consulting services (software)	_____	_____	_____	_____
e) Customer training	_____	_____	_____	_____
f) Installation management and coordination	_____	_____	_____	_____
g) Supplies sales	_____	_____	_____	_____
h) Add-on sales (additional equipment)	_____	_____	_____	_____
i) Upgrade sales (new equipment or features)	_____	_____	_____	_____
j) Site audits	_____	_____	_____	_____
k) Facility relocation	_____	_____	_____	_____
l) De-installation	_____	_____	_____	_____
m) Software sales	_____	_____	_____	_____
n) Ancillary equipment sales and service	_____	_____	_____	_____

3. How do you rate your field service organization in the following categories, and how do you believe your users would rate you in the same categories? (Scale 1-10: 10 = excellent, 5 = average, 1 = very poor.)

CATEGORIES RATED: (service over the past 12 months)	RATING (1-10)	
	SELF RATING	EXPECTED USER RATING
a) Management's communication with users	_____	_____
b) Hardware service engineer's communication	_____	_____
c) Software service engineer's communication	_____	_____
d) Ability to diagnose hardware problems and to make quality repairs	_____	_____
e) Ability to maintain software	_____	_____
f) General responsiveness of the organization to user requirements	_____	_____
g) Overall service image	_____	_____
h) Taking initiative to improve user operations	_____	_____
i) Resolution of invoicing disputes	_____	_____
j) Dispatching trouble calls	_____	_____
k) Escalation procedures during extended outages	_____	_____

4. Please either respond to the following questions or provide us with a functional organization chart (space is provided on the reverse side of this page for your sketch if that is more convenient for you).

FUNCTION	(√) IF NOT FS	TITLE	REPORTS TO (title/function)
a) Top-level field service executive	_____	_____	_____
b) Top-level domestic line executive	_____	_____	_____
c) Top international line executive	_____	_____	_____
d) Field support, general	_____	_____	_____
e) Field support, hardware	_____	_____	_____
f) Field support, software	_____	_____	_____
g) Financial operations	_____	_____	_____
h) Administration	_____	_____	_____
i) Logistics	_____	_____	_____
j) Operations analysis	_____	_____	_____
k) Education	_____	_____	_____
l) Personnel	_____	_____	_____
m) Field service marketing	_____	_____	_____
n) Engineering liaison	_____	_____	_____
o) OEM liaison	_____	_____	_____
p) Legal	_____	_____	_____
q) Other _____	_____	_____	_____
r) Other _____	_____	_____	_____

5. Lower level management and employees are encouraged by some companies to participate in the following activities. Please check those that apply now and in the near future for your company. (Enc. = Encouraged, Mand. = Mandatory.)

ACTIVITIES	1983		1985		1987	
	ENC.	MAND.	ENC.	MAND.	ENC.	MAND.
a) Making good-will calls on users	_____	_____	_____	_____	_____	_____
b) Selling maintenance contracts	_____	_____	_____	_____	_____	_____
c) Accompanying sales personnel on sales calls	_____	_____	_____	_____	_____	_____
d) Attending sales meetings	_____	_____	_____	_____	_____	_____
e) Furthering formal education	_____	_____	_____	_____	_____	_____
f) Making public appearances	_____	_____	_____	_____	_____	_____
g) Joining organizations such as AFSM, Jaycees, etc.	_____	_____	_____	_____	_____	_____
h) Reading trade journals	_____	_____	_____	_____	_____	_____
i) Other _____	_____	_____	_____	_____	_____	_____
j) Other _____	_____	_____	_____	_____	_____	_____
k) Other _____	_____	_____	_____	_____	_____	_____

## B. Field Support/Product Support

1. Please rate the trends of the influence of your field service management in the following company activities relative to peripherals and terminals. (Scale of 1-10: 10 = excellent, 5 = average, 1 = very poor.)

ACTIVITIES	RATING (1-10)		
	1982	1983	EXPECTED 1984
a) Product specification	_____	_____	_____
b) Product design	_____	_____	_____
c) Serviceability design	_____	_____	_____
d) Documentation	_____	_____	_____
e) Diagnostic development	_____	_____	_____
f) Selection of test equipment	_____	_____	_____
g) Spares requirements	_____	_____	_____
h) Geographic control of sales	_____	_____	_____
i) Exceptions to standard maintenance agreements	_____	_____	_____
j) Product performance objectives	_____	_____	_____
k) Quality control in manufacturing	_____	_____	_____
l) OEM acceptance criteria	_____	_____	_____
m) Customer education	_____	_____	_____

2. As it relates to servicing attached peripherals and terminals, please indicate the level that software support has been or will be integrated into the hardware support structure. (0% = no field service responsibility, 100% = fully integrated responsibility.)

SOFTWARE SUPPORT ACTIVITY	PERCENT INTEGRATED			
	1982	1983	1985	1987
a) System control programs at headquarters support level	____%	____%	____%	____%
b) System control programs in the field	____	____	____	____
c) Compilers and system utilities at headquarters	____	____	____	____
d) Compilers and system utilities in the field	____	____	____	____
e) Applications software developed, sold, or distributed by your company - headquarters support	____	____	____	____
f) Applications (as in "e" above) in the field	____	____	____	____
g) Maintenance of third-party software, including user's, at headquarters level	____	____	____	____
h) Maintenance of third-party software in the field	____	____	____	____

3. Please describe your field support or support center structure as it relates to:

- a) User support requirements when users are involved via remote diagnostics.

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- b) User support requirements when users are assisted through preliminary stages of problem determination.

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3. (Continued)

c) Support of on-site field personnel via telephone and/or remote diagnostics.

d) Physical, on-site support to field personnel (please discuss criteria):

4. Please provide the objectives and actuals in product performance for the most active peripherals and terminals serviced by your organization.

MODEL NUMBER OR NAME OF MAINFRAMES	MEAN TIME TO REPAIR (hours)		MEAN TIME BETWEEN FAILURES (hours)		AVERAGE AVAILABILITY (percent)		MEAN TIME TO RESPOND (hours)	
	OBJ.	ACT.	OBJ.	ACT.	OBJ.	ACT.	OBJ.	ACT.
a) <div></div>								
b) <div></div>								
c) <div></div>								
d) <div></div>								
e) <div></div>								

5. Please check the following items that apply in your field support organization (even if applicable to only one product currently serviced in the field). If not presently implemented, please indicate year scheduled.

	CURRENTLY IMPLEMENTED? YES/NO	YEAR SCHEDULED
a) Remote diagnostics	_____	_____
b) Centralized dispatching	_____	_____
c) Modular, plug-in units for user to deliver to repair centers	_____	_____
d) Real-time incident reporting	_____	_____
e) Real-time IR (parts usage included)	_____	_____
f) Signature analysis (field)	_____	_____
g) Regional repair centers	_____	_____
h) Third-party repair centers	_____	_____
i) Third-party on-site maintenance	_____	_____
j) User support centers	_____	_____

6. a) What has been the trend in your capital investment in peripherals and terminals spare parts inventories for the years indicated below? Please respond by percentage of gross service revenues derived from support of peripherals and terminals.

YEAR OF MEASUREMENT	PERCENT OF GROSS SERVICE REVENUES FOR YEAR
1981	_____ %
1982	_____ %
1983 (most recent inventory)	_____ %
1984 (projected)	_____ %
1985 (projected)	_____ %

b) To what most significant factors do you contribute the changes, i.e., growth of installed base, regional spares depots, regional repair centers, reliability of new products, etc.?

Comment: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7. a) Have you announced or have you set a policy on the maintenance and support of local area networks serving competitive products? Yes/No\_\_\_\_\_

b) If yes, please comment on your position.

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c) If no, do you have any general comment on the subject of local area networks without making a policy statement?

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## C. Financial/Administrative Operations

1. How do you measure changes in field service productivity when measuring the effectiveness of changes in operating methods or investment in capital improvements?

MEASUREMENT METHOD:	YES/NO
a) Ratio of gross revenue carried per field service person per month	_____
b) Ratio of personnel to equipment by category of equipment	_____
c) Ratio of personnel to management	_____
d) Net ratio of expenses to revenue after cost of improvement	_____
e) Other _____	_____
_____	_____
_____	_____

2. What levels of productivity have you realized in servicing peripherals and terminals for the following? (Please classify measurement using a-e in question 1 above.)

IMPROVEMENT	MEASUREMENT METHOD (a-e)	PRODUCTIVITY IMPROVEMENT (percent)
a) Remote diagnostics	_____	_____
b) Repair centers	_____	_____
c) Regional parts' depots	_____	_____
d) Centralized dispatch	_____	_____
e) Support centers	_____	_____
f) Field education	_____	_____
g) Cross training	_____	_____
h) Multiple territory assignments	_____	_____
i) Other _____	_____	_____
_____	_____	_____
_____	_____	_____

3. Please indicate the percentage of total operating revenues credited to the field service division coming from the following categories. (If fiscal is different from calendar, please supply FY dates.)

SOURCE OF REVENUE CREDITS	PERCENT OF TOTAL REVENUE		
	1982	1983	1984
a) Equipment warranty credits	_____ %	_____ %	_____ %
b) Basic period contracts for maintenance	_____	_____	_____
c) Extra shift premium	_____	_____	_____
d) Time and material (labor)	_____	_____	_____
e) Time and material (parts)	_____	_____	_____
f) Third-party contracts	_____	_____	_____
g) Installation charges	_____	_____	_____
h) De-installation charges	_____	_____	_____
i) Technical consulting	_____	_____	_____
j) Management consulting	_____	_____	_____
k) Parts repairs	_____	_____	_____
l) Parts sales	_____	_____	_____
m) Supplies sales	_____	_____	_____
n) Sales of ancillary equipment	_____	_____	_____
o) Maintenance of ancillary equipment	_____	_____	_____
p) Sales of software products	_____	_____	_____
q) Maintenance of software products	_____	_____	_____
r) Revenues from other divisions	_____	_____	_____
s) Other _____	_____	_____	_____
t) Other _____	_____	_____	_____
u) Other _____	_____	_____	_____

4. Please indicate the percentage of total field service division expenses in the following categories (and supply FY dates if different from calendar year).

EXPENSE LINE ITEM	PERCENT OF TOTAL EXPENSES [use ( ) to indicate credit]		
	1982	1983	1984
a) Basic direct labor, wages, salaries	_____	_____	_____
b) Direct labor overtime shift premiums and standby pay	_____	_____	_____
c) Support personnel salaries	_____	_____	_____
d) Management and administrative salaries and premiums	_____	_____	_____
e) Benefits programs	_____	_____	_____
f) Net parts usage	_____	_____	_____
g) Inventory variances	_____	_____	_____
h) Depreciation	_____	_____	_____
i) Travel (includes auto leases)	_____	_____	_____
j) Relocation	_____	_____	_____
k) Education	_____	_____	_____
l) Equipment rental/lease	_____	_____	_____
m) Office, warehouse space	_____	_____	_____
n) Communications	_____	_____	_____
o) Interdivisional transfers	_____	_____	_____
p) Logistics, repair depot, and other expenses not reported above	_____	_____	_____
q) Corporate general and administrative allocation (overhead)	_____	_____	_____
r) Other significant categories	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

5. Please check any of the following interdivisional transfers of revenues and expenses between your field service division and other departments, and indicate whether they are treated as revenue or expense items by checking the appropriate columns. (Check all columns that apply.)

INTERDIVISIONAL TRANSFERS OF ITEMS	REVENUE (FE)		EXPENSE (FE)	
	CREDIT (✓)	DEBIT (✓)	CREDIT (✓)	DEBIT (✓)
a) Warranty of equipment	_____	_____	_____	_____
b) Spare parts used during warranty	_____	_____	_____	_____
c) Direct labor during warranty	_____	_____	_____	_____
d) Sales assistance	_____	_____	_____	_____
e) Maintenance sales commissions	_____	_____	_____	_____
f) Manufacturing assistance	_____	_____	_____	_____
g) Engineering assistance	_____	_____	_____	_____
h) Extended warranties	_____	_____	_____	_____
i) Nonstandard contract terms, e.g., on-site engineers	_____	_____	_____	_____
j) Defective spare parts	_____	_____	_____	_____
k) Sales changes to equipment	_____	_____	_____	_____
l) Safety changes	_____	_____	_____	_____
m) Engineering changes	_____	_____	_____	_____
n) Other _____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

6. Please supply the figures as indicated for your overall financial performance (indicate fiscal year if different from calendar year).

FINANCIAL PERFORMANCE	FISCAL YEAR END _____			
	1982	1983	1984	1987
a) Field service revenue (\$ millions)	_____	_____	_____	_____
b) Field service expenses (\$ millions)	_____	_____	_____	_____
c) Pretax profit (percent)	_____	_____	_____	_____
d) Revenue per field service engineer (direct labor)	_____	_____	_____	_____
e) Direct expense per field service engineer (direct labor)	_____	_____	_____	_____
f) Fully burdened expense per field service engineer (direct labor)	_____	_____	_____	_____
g) Basic hourly rate charged for service	_____	_____	_____	_____
h) Fully burdened field service expense per field service employee (all categories)	_____	_____	_____	_____



7. Please comment below on service to remote customers: zone charges, response times, etc.

a) Zone definitions:

Primary zone      0   —        miles

Zone 2                  —        miles

Zone 3                  —        miles

Other criteria: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b) Zone premiums added to basic maintenance charges: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

c) Response time targets for zones: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

d) Other comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. a) Please describe the methodology your company uses to set maintenance prices (percent of purchase tested against cost of service projection, etc.):

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- b) At what ratio of basic maintenance price to list price do you believe that:

	PERIPHERALS	TERMINALS
i) Users will actively consider alternative sources	_____ %	_____ %
ii) Users will definitely contract third party or maintain own equipment	_____ %	_____ %
iii) Users will refuse to buy the original product, given the option	_____ %	_____ %

- c) How frequently have you and do you expect to change prices of maintenance for:

	FREQUENCY OF CHANGE (months)			
	1982	1983	1984	1985
i) Peripherals	_____	_____	_____	_____
ii) Terminals	_____	_____	_____	_____
iii) Basic hourly rates	_____	_____	_____	_____
iv) Shift differential	_____	_____	_____	_____

- d) Do you offer discounts for:

	PERCENT DISCOUNT
i) User assistance in remote diagnostics	_____ %
ii) User replacement of plug-in modules or units	_____ %
iii) User delivery of plug-in modules or units to repair center	_____ %
iv) Relaxed requirement on response time	_____ %
v) User purchase of spare parts kits	_____ %
vi) Other: _____	_____ %

## 9. Contract administration:

a) Are your maintenance contracts: (i) automatically renewed \_\_\_\_\_ or (ii) negotiated each renewal cycle? \_\_\_\_\_

b) What is the length of your normal contract? \_\_\_\_\_ (months)

c) Do you normally invoice (i) monthly \_\_\_\_\_, (ii) quarterly \_\_\_\_\_, (iii) semiannually \_\_\_\_\_, (iv) annually \_\_\_\_\_, (v) other \_\_\_\_\_.

d) Do you invoice for exceptions (time and material, etc.) at a different time than your normal cycle?  
Yes/No \_\_\_\_\_ If yes, please describe:

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e) Who is responsible for maintenance contract:

i) Negotiation \_\_\_\_\_

ii) Renewal \_\_\_\_\_

iii) Administration \_\_\_\_\_

10. a) Has your field service division implemented a field quality assurance program or other formal operational audit? Yes/No \_\_\_\_\_

b) If yes, please describe: \_\_\_\_\_

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11. What is the average cost breakdown of a typical fault call? (Please respond for products your company services.)

PRODUCT SERVICED	TOTAL COST (dollars)	DIRECT LABOR (percent)	TRAVEL (percent)	PARTS (percent)	OVERHEAD & SUPPORT
Large mainframes	_____	_____	_____	_____	_____
Medium mainframes	_____	_____	_____	_____	_____
Small systems	_____	_____	_____	_____	_____
Peripherals	_____	_____	_____	_____	_____
Terminals	_____	_____	_____	_____	_____
Word processors	_____	_____	_____	_____	_____
Personal computers	_____	_____	_____	_____	_____
Copiers, facsimile	_____	_____	_____	_____	_____
Work stations	_____	_____	_____	_____	_____
PABX, PBX	_____	_____	_____	_____	_____
Teleprocessing/communications	_____	_____	_____	_____	_____

## D. Personnel

1. Please identify your sources of new employees and rate them on a scale of 1-10. (1 = little or no importance, 10 = highest importance.)

SOURCE OF NEW EMPLOYEES	RATING (1-10)			
	1982	1983	1984	1987
a) Competition	_____	_____	_____	_____
b) Trade schools	_____	_____	_____	_____
c) Military schools	_____	_____	_____	_____
d) Two-year college programs	_____	_____	_____	_____
e) Four-year colleges	_____	_____	_____	_____
f) Apprenticeship programs	_____	_____	_____	_____
g) Other division in company	_____	_____	_____	_____
h) Employee referrals	_____	_____	_____	_____
i) Headquarters	_____	_____	_____	_____
j) Other: _____	_____	_____	_____	_____

2. Do you provide in-company formal training for:

	YES/NO
a) Indoctrination	_____
b) Basic training (apprentice level)	_____
c) Product (technical)	_____
d) Systems software (system)	_____
e) Applications software	_____
f) Management development	_____
g) Technological upgrading	_____

3. Do you fully (F) or partially (P) reimburse or otherwise provide financial support for:

	F/P
a) University courses	_____
b) Out-company seminars in management development	_____
c) Professional association membership	_____
d) Purchase of company stock	_____
e) Professional trade journals	_____
f) Matching grants to educational institutions	_____
g) Children's higher education	_____
h) Out-company training in professional (technical) development	_____
i) Nonexempt employee relocation	_____
j) New-hire relocation	_____
k) Exempt employee relocation	_____
l) Lease or purchase of automobiles to be used for business	_____
m) Lease or purchase of company products (micros, minis, personal computers, typewriters, etc.)	_____
n) Other: _____	_____
_____	_____
_____	_____

4. Do your personnel policies and procedures provide for the following employee benefits and assurances? (Y/N)

FRINGE BENEFITS	EXEMPT		NONEXEMPT	
	1983	BY 1985	1983	BY 1985
a) Life insurance	_____	_____	_____	_____
b) Hospitalization	_____	_____	_____	_____
c) Major medical (80% or better)	_____	_____	_____	_____
d) Limited medical (out patient)	_____	_____	_____	_____
e) Dental	_____	_____	_____	_____
f) Eyesight/glasses	_____	_____	_____	_____
g) Retirement	_____	_____	_____	_____
h) Disability insurance	_____	_____	_____	_____
i) Matched savings	_____	_____	_____	_____
j) Profit-sharing	_____	_____	_____	_____
k) Paid sick leave	_____	_____	_____	_____
l) Grievance procedures	_____	_____	_____	_____
m) Improvement programs for marginal performers	_____	_____	_____	_____
n) Exit interviews	_____	_____	_____	_____
o) Appraisal and counseling	_____	_____	_____	_____
p) Career path definitions	_____	_____	_____	_____
q) Pay for performance guidelines	_____	_____	_____	_____

5. Does your company provide incentives for field service employees? (Indicate by check mark.)

INCENTIVES	MANAGEMENT		EXEMPT		NONEXEMPT	
	1983	BY 1985	1983	BY 1985	1983	BY 1985
a) Stock options	_____	_____	_____	_____	_____	_____
b) Performance bonuses	_____	_____	_____	_____	_____	_____
c) Suggestion awards	_____	_____	_____	_____	_____	_____
d) Periodic recognition awards ("FE of the quarter," etc.)	_____	_____	_____	_____	_____	_____
e) Special projects, foreign assignments, etc.	_____	_____	_____	_____	_____	_____
f) Award conferences, trips	_____	_____	_____	_____	_____	_____
g) Competitive scholarships for employees or family	_____	_____	_____	_____	_____	_____
h) Other: _____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____



6. a) How many direct labor field service personnel were hired in the following years?

1982 \_\_\_\_\_

1983 \_\_\_\_\_ (forecast)

1984 \_\_\_\_\_ (forecast)

b) How many direct-labor field service personnel left your company in:

1982 \_\_\_\_\_

1983 \_\_\_\_\_ (forecast)

c) What percentage of the persons leaving leave for the following reasons:

	1982	1983
i) Voluntary, no reason given	_____ %	_____ %
ii) Left for higher salary, better total compensation	_____	_____
iii) Released for company reasons	_____	_____
iv) Promotion in another company	_____	_____
v) Relocation by another company	_____	_____
vi) Promoted within own company	_____	_____
vii) Transferred to foreign subsidiary or other division	_____	_____
viii) Other _____	_____	_____
Total	100%	100%

d) Staffing levels:

U.S. EMPLOYEES	1983	1984
i) Total employees in company	_____	_____
ii) Total in field service division	_____	_____
iii) Number of direct-labor FEs	_____	_____
iv) Number of field support engineers	_____	_____
v) Number of field supervisors	_____	_____
vi) Number of managers in field	_____	_____
vii) Line managers at headquarters	_____	_____
viii) FE staff managers (total)	_____	_____
ix) FE staff personnel (nonmanagement including administration)	_____	_____

## 7. 1983 annual salaries, Peripheral/Terminals field engineers (front-line product field service technicians)

JOB DESCRIPTION	TITLE	(✓) EXEMPT	NUMBER IN U.S.	RANGE		AVERAGE PAID (actual)	AVERAGE GAIN OVER 1982 (percent)
				MAXIMUM	MINIMUM		
a) Entry-level trainee for hardware maintenance	_____	( )	_____	_____	_____	_____	_____%
b) Entry-level trainee in software maintenance	_____	( )	_____	_____	_____	_____	_____%
c) Minimum experience level qualified to respond to trouble calls, generally requires assistance	_____	( )	_____	_____	_____	_____	_____%
d) Qualified field service technician carries territory, requires occasional assistance, renders some aid to lower levels	_____	( )	_____	_____	_____	_____	_____%
e) Senior-level field service technician: generally gives more assistance than received, assigned field training duties to assist in development of first two categories (above)	_____	( )	_____	_____	_____	_____	_____%
f) Qualified field service engineer in software support	_____	( )	_____	_____	_____	_____	_____%
g) Senior level software support in field	_____		_____	_____	_____	_____	
h) Top-level hardware specialist located in field office	_____	( )	_____	_____	_____	_____	_____%
i) Top-level software specialist located in field office	_____	( )	_____	_____	_____	_____	_____%

## 8. 1983 annual salaries, field office staff personnel

JOB DESCRIPTION	TITLE	(✓) EXEMPT	NUMBER IN U.S.	RANGE		AVERAGE PAID (actual)	AVERAGE GAIN OVER 1982 (percent)
				MINIMUM	MAXIMUM		
a) Repair depot, repair technician trainee	_____	( )	_____	_____	_____	_____	_____%
b) Repair depot, repair technician	_____	( )	_____	_____	_____	_____	_____%
c) Senior-level repair depot technician	_____	( )	_____	_____	_____	_____	_____%
d) Office administrator, Jr.	_____	( )	_____	_____	_____	_____	_____%
e) Office administrator, Sr.	_____	( )	_____	_____	_____	_____	_____%
f) Field service supervisor may work approximately 50/50 on equipment and management	_____	( )	_____	_____	_____	_____	_____%
g) First-line manager of field service engineers	_____	( )	_____	_____	_____	_____	_____%
h) Second-line manager located in field offices	_____	( )	_____	_____	_____	_____	_____%
i) Staff manager in education and field support	_____	( )	_____	_____	_____	_____	_____%
j) Staff manager in operations and financial analysis	_____	( )	_____	_____	_____	_____	_____%
k) Field service administration manager	_____	( )	_____	_____	_____	_____	_____%
l) Field service personnel manager	_____	( )	_____	_____	_____	_____	_____%









